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ABSTRACT

Eleven student learning guides are provided for the duty entitled "completing core curriculum" of the diesel equipment program. Each learning guide concerns one of the tasks that comprise the duty. Introductory materials for each guide include the purpose and performance and enabling objectives. For each enabling objective, these materials are provided: a list of learning activities and required resources, instruction sheets, and self-checks. A listing of instructional resources, a knowledge test, and a performance test conclude each learning guide. These tasks are covered: describe principles of diesel and gasoline engines; identify vises and clamps; identify power tools; identify fasteners; select hammers, chisels, and punches; identify screwdrivers and hand tools; identify saws and files; select taps and dies; practice shop safety; use twist drills; and select wire wheels and brushes. (YLB)

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STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

DUTY

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REVISED

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 0 4 Describe Principles of 2 and 4 Cycle Diesel and Gasoline Engines

PURPOSE:

A diesel engine is built in two different classifications: 2 cycle principle and the 4 cycle principle. A diesel mechanic needs to know how these two engines operate. This Learning Guide will assist you in gaining the knowledge you need to know about the two and four cycle diesel engine principles.

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DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment and Operation Instructor
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

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PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to equipment and tools,

YOU WILL: describe principles of 2 and 4 cycle diesel and gasoline engine.

HOW WELL: You must successfully complete the Knowledge Test.

ENABLING OBJECTIVES:

1. Identify the parts and function of the diesel engine.
2. Identify one working cycle of a two and four cycle engine.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1

number

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DUTY

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Enabling objective

Identify the parts and function of a diesel engine.

PROCEDURE

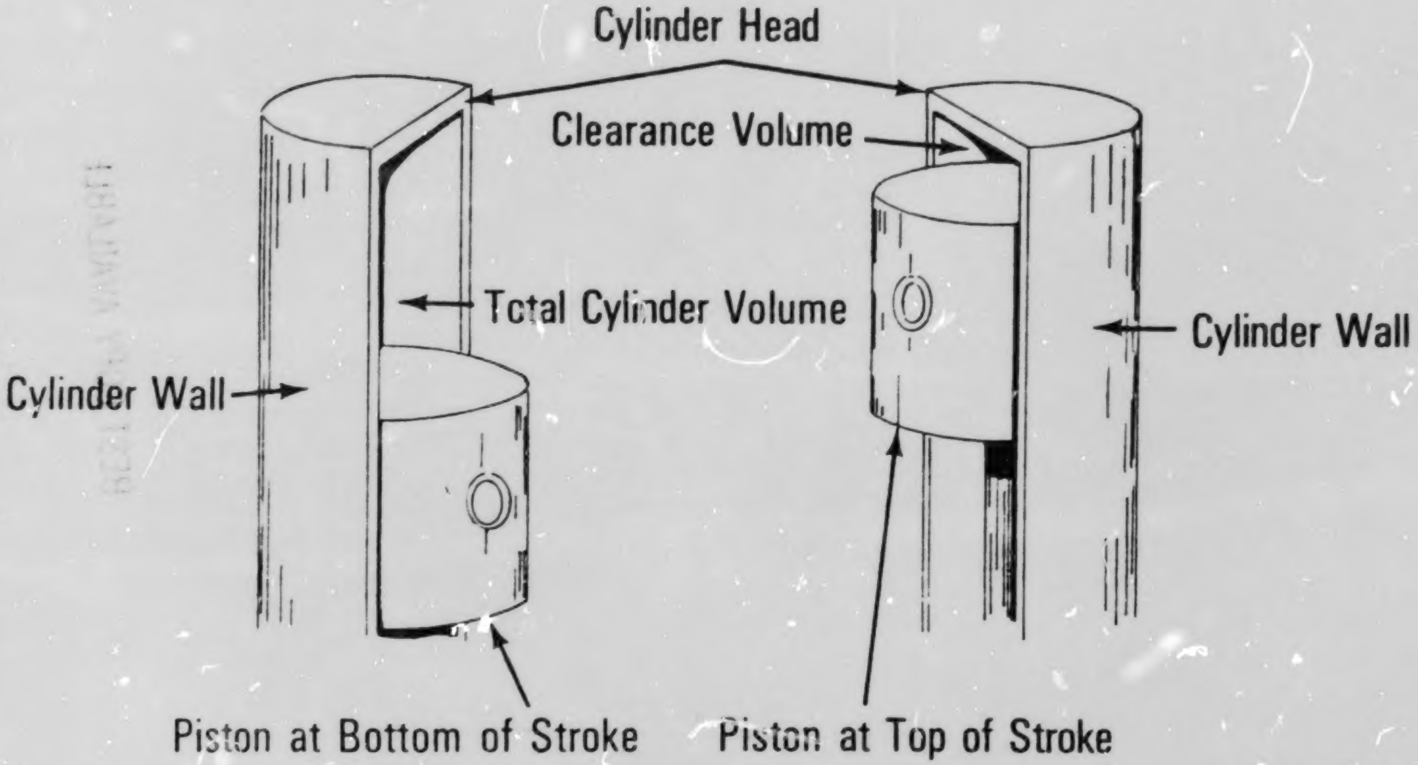
LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the terms.	1. Instruction Sheet enclosed. Terms
2. Using Resource No. 2 to identify the basic parts of a diesel engine.	2. Instruction sheet enclosed, Parts of a Diesel Engine
3. Complete the Self-Check.	3. Self-Check enclosed.
4. Go on to Enabling Objective No. 2.	

Terms

1. Volume -- total space between the piston at its lowest position in the cylinder and the bottom of the cylinder head. See Instruction Sheet, Cylinder Terms.
2. Clearance volume -- total space between the piston at its highest position in the cylinder and the cylinder head. See Instruction Sheet, Cylinder Terms.
3. Compression -- the reduction in volume of gases trapped in the cylinder by the upward motion of the piston.
4. Compression ratio -- ratio of whole cylinder volume to least cylinder volume. See Instruction Sheet, Compression Ratio.

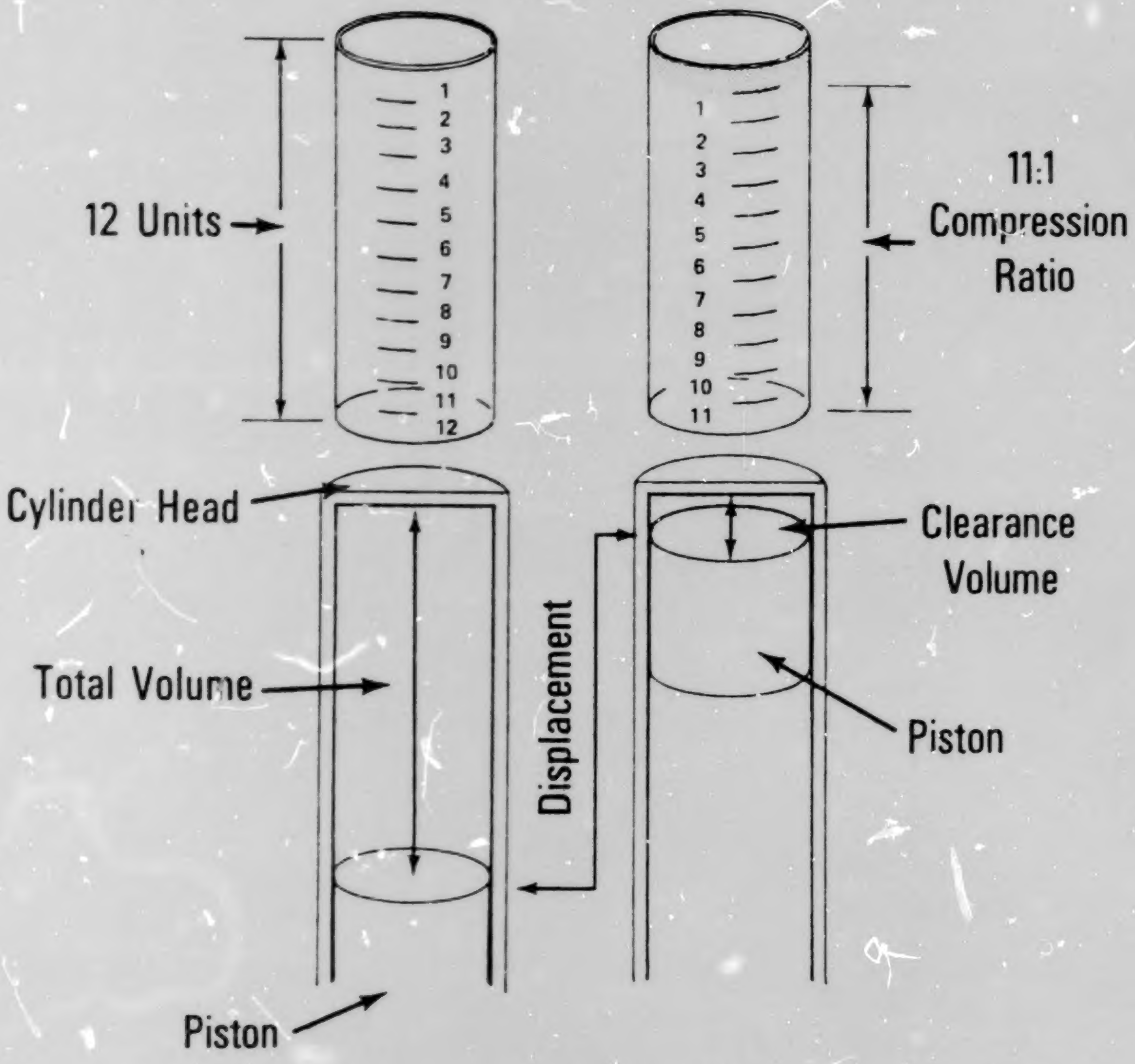
   NOTE: THE LEAST CYLINDER VOLUME IS THE CLEARANCE VOLUME.
5. Compression ignition -- ignition of the fuel by the heat from compression.
6. Temperature -- measure of heat intensity.
7. Combustion -- action or operation of burning.
8. Pre-combustion chamber -- cavity in the cylinder head of some diesels where some burning of fuel first takes place.
9. Piston crown -- surface shape of the top of the piston. See Instruction Sheet, Piston Crown Design.
10. TDC (Top Dead Center) -- piston at highest point of travel. See Instruction Sheet, Piston Stroke.
11. BDC (Bottom Dead Center) -- piston at lowest point of travel. See Instruction Sheet, Piston Stroke.
12. Stroke -- distance the piston moves when traveling from TDC to BDC. See Instruction Sheet, Piston Stroke.
13. Engine speed -- crankshaft revolutions per minute.
14. Power control -- controlling the engine power by varying or governing the amount of fuel injected into the combustion chamber.
15. Cycle -- series of events that repeat themselves in a regular sequence.

Cylinder Terms

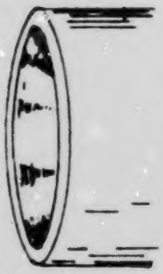
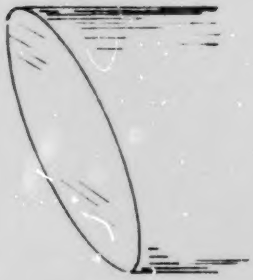
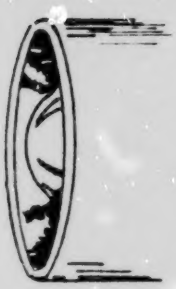
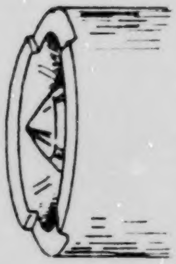
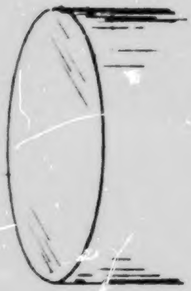
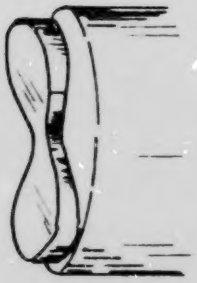
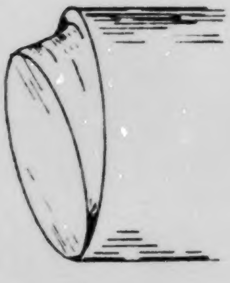

Cylinder Head
Clearance Volume
Total Cylinder Volume
Cylinder Wall
Cylinder Wall
Piston at Bottom of Stroke
Piston at Top of Stroke

DUTY	TASK	EN. OBJ.	DEPT.	PROG.

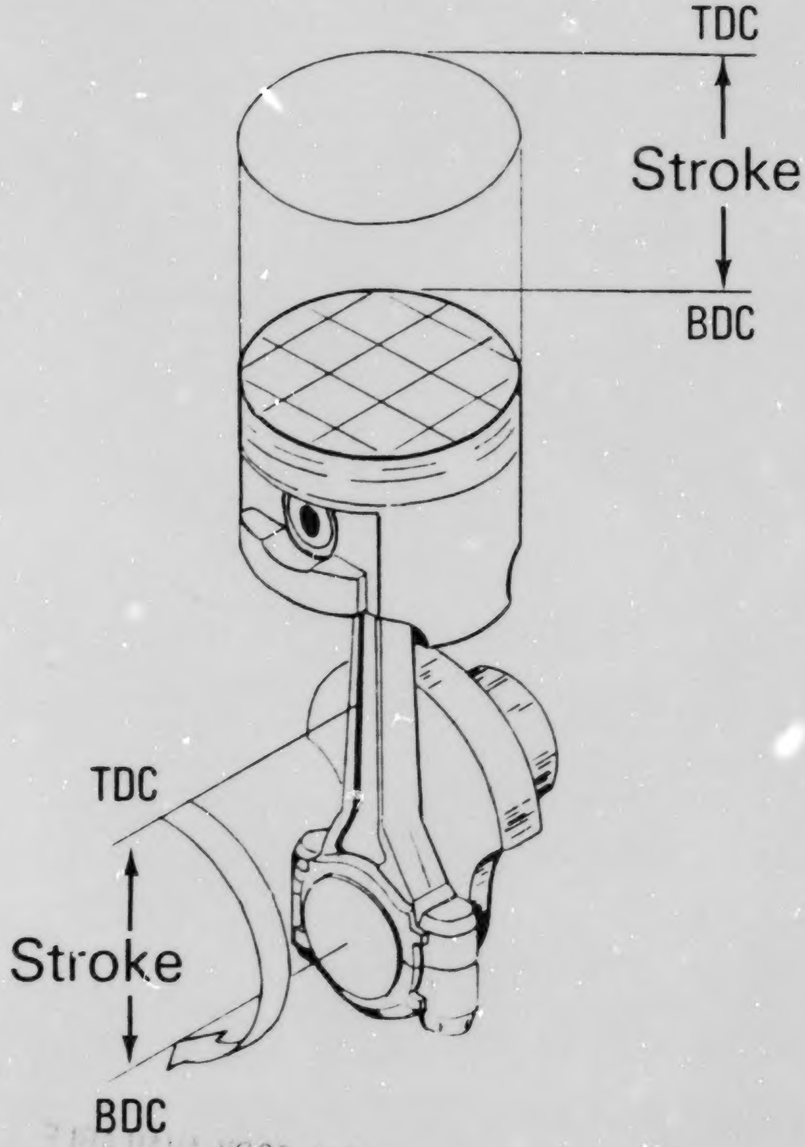
Compression Ratio


12 Units
1
2
3
4
5
6
7
8
9
10
11
12
11:1 Compression Ratio
Cylinder Head
Clearance Volume
Total Volume
Displacement
Piston
Piston

Piston Crown Designs

Piston Stroke


TDC
Stroke
BDC
TDC
Stroke
BDC

Parts of a Diesel Engine

The following will describe the parts of a diesel engine and the function of each.

1. Cylinder block -- solid casting which includes the cylinders and water jackets.
2. Cylinders -- holes in the cylinder block containing the pistons.
3. Pistons -- movable plugs open at one end which transfer force of explosion to the connecting rod.
4. Connecting rod -- connecting link between the piston and crankshaft.
5. Crankshaft -- main shaft of an engine which, turned by the connecting rods, changes the reciprocating motion of the piston to the rotary motion in the power train.

   NOTE: Portions are offset to form throws to which the connecting rods are attached.
6. Crankshaft gear -- drives the camshaft or idler gear.
7. Camshaft -- shaft with cam lobes used to operate the valves.
8. Timing gear -- gear by which the camshaft is driven by the crankshaft.
9. Cam lobes -- Eccentrics on the camshaft that operate the valves.
10. Push rods -- rod links that transfer motion from the lifter to the rocker arm.
11. Rocker arm -- transfers motion from push rod to valve to open the valve.
12. Valve lifter -- rides on the camshaft so that the cam lobe raises it to operate the valve.

    NOTE: The valve lifter is also called the cam follower.
13. Valves -- open and close the cylinder to allow air to enter or gases to leave the cylinder.
14. Cylinder head -- metal section bolted to the block to close one end of the cylinder, which usually contains the valves.
15. Cooling passageway -- hollow space in block through which coolant circulates.
16. Wrist pin -- serves as floating connecting piece for piston and connecting rod.
17. Oil pump -- provides pressure that circulates oil to rotating or reciprocating engine parts to minimize friction.
18. Oil pan -- reservoir for engine oil.
19. Intake valve -- permits air to enter the cylinder.
20. Exhaust valve -- opens and allows exhaust gases to be forced from engine cylinder.
21. Flywheel -- attaches to the end of the crankshaft and provides inertia to carry the crankshaft around from one firing impulse to the other.

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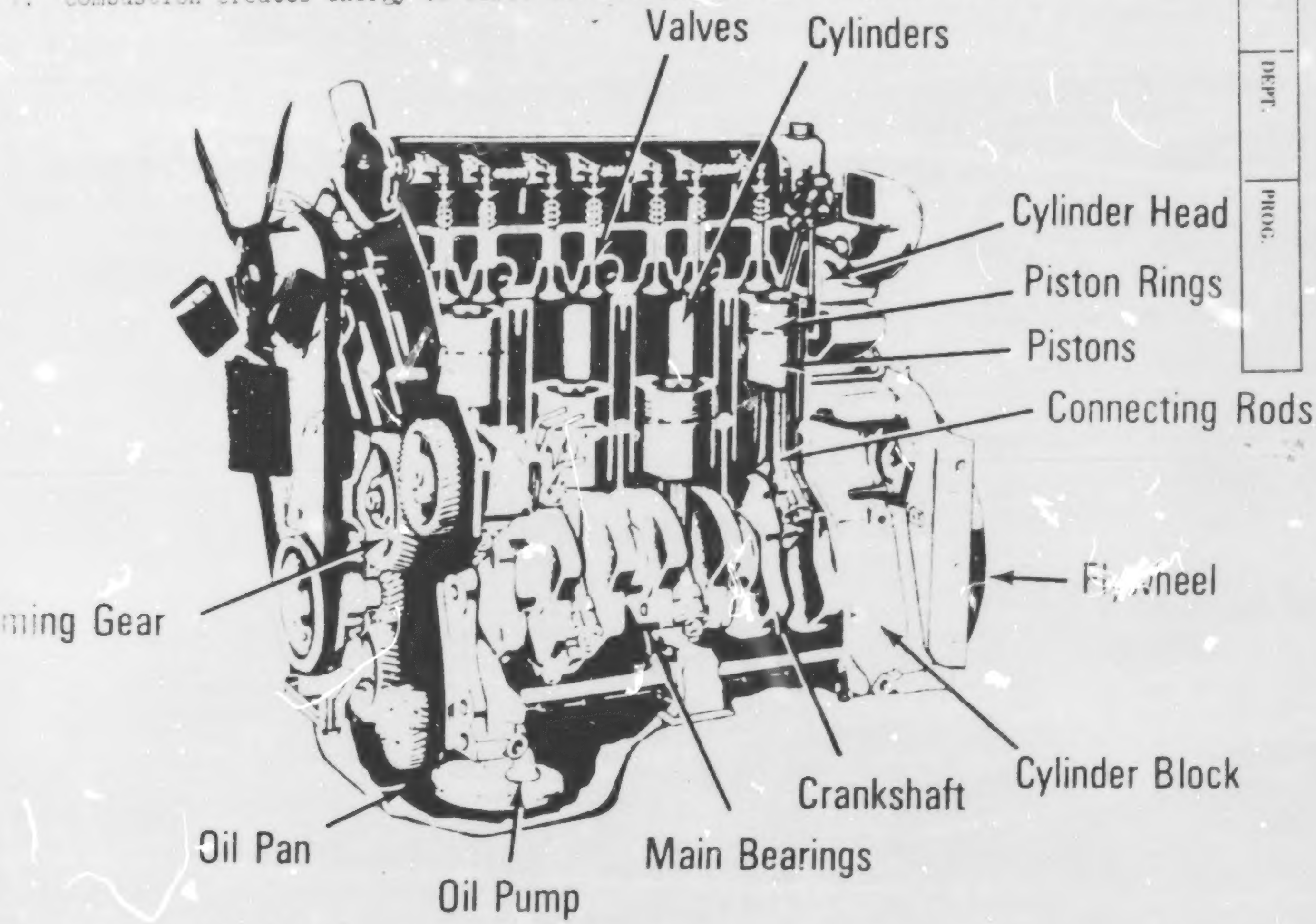
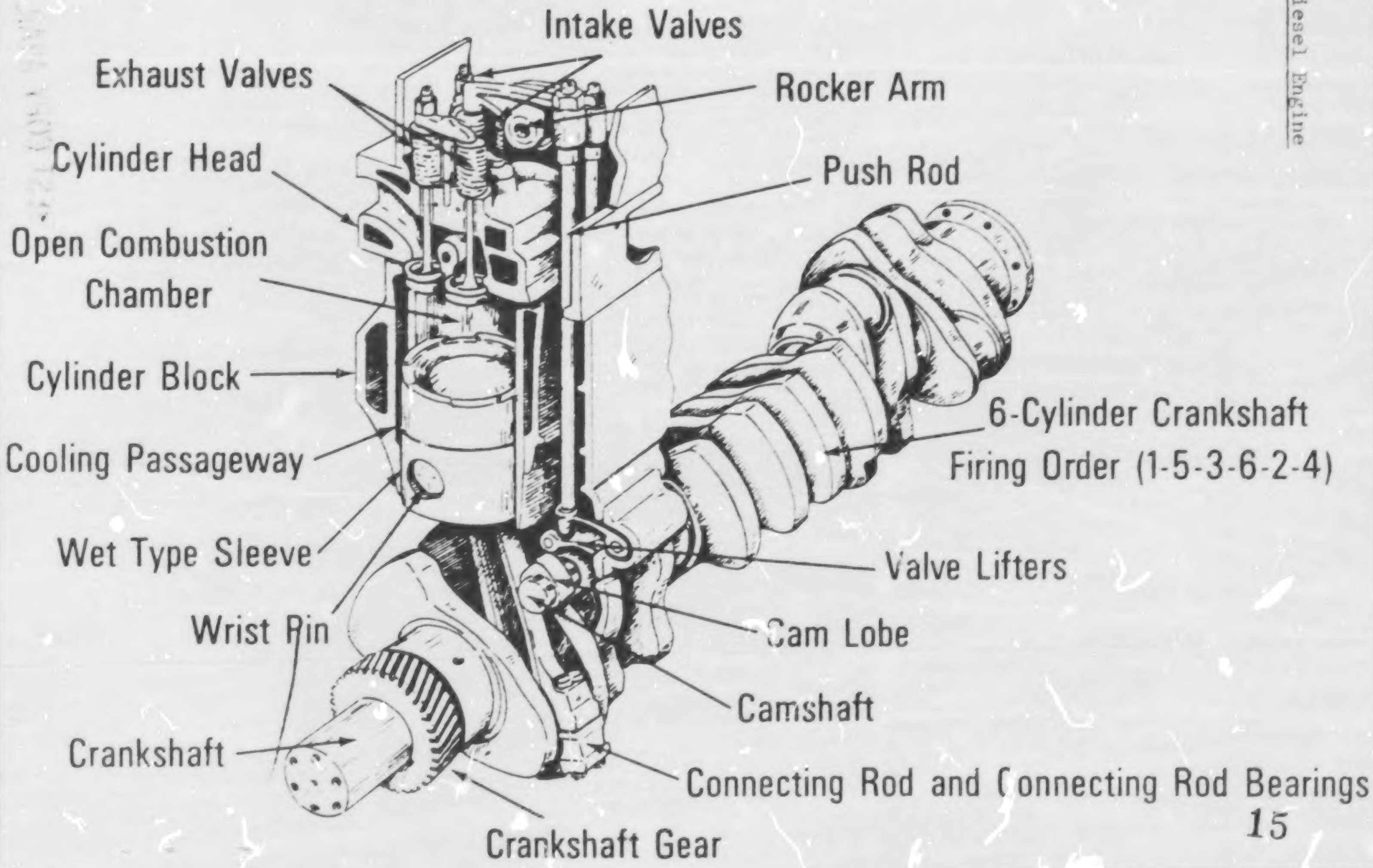
Operation of the diesel engine.....

1. Piston moves up on compression stroke.
2. Air is trapped in the cylinder causing pressure to rise.
3. Pressure rise causes high temperature.
4. Piston reaches top dead center.
5. Hot compressed air ignites the fuel.
6. Combustion occurs.
7. Combustion creates energy to force the piston down on the power stroke.

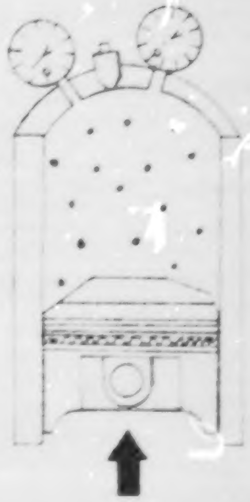

Valves
Cylinders
Cylinder Head
Piston Rings
Pistons
Connecting Rods
Flywheel
ming Gear
Cylinder Block
Crankshaft
Main Bearings
Oil Pan
Oil Pump

NOTE: POWER IS CONTROLLED BY THE AMOUNT OF FUEL INJECTED INTO THE CYLINDER.

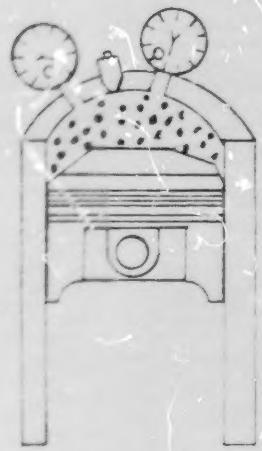
Parts of a Diesel Engine


Intake Valves
Exhaust Valves
Rocker Arm
Cylinder Head
Push Rod
Open Combustion Chamber
Cylinder Block
6-Cylinder Crankshaft Firing Order (1-5-3-6-2-4)
Cooling Passageway
Wet Type Sleeve
Valve Lifters
Wrist Pin
Cam Lobe
Camshaft
Crankshaft
Connecting Rod and Connecting Rod Bearings
Crankshaft Gear

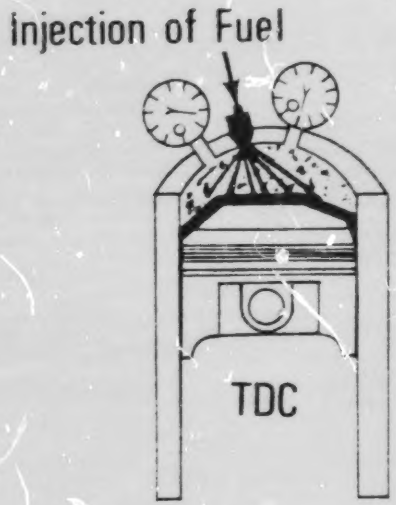
DUTY	TASK	EN. OBJ.	DEPT.	PROG.



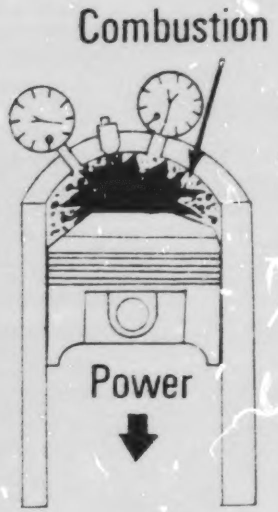
Piston moves up on compression stroke



Air is trapped in the cylinder causing pressure to rise



Piston reaches TDC and fuel is injected into the cylinder

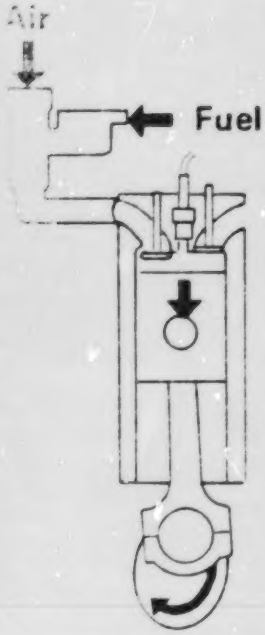


Hot compressed air ignites the fuel, combustion occurs, and this creates energy to force the piston down on the power stroke

DUTY	TASK	EN. OBJ.	DEPT.	PROG.

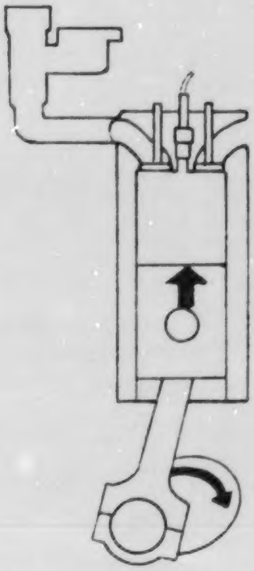
Working Cycle of a Two and Four Stroke Engine

Four Stroke Engine



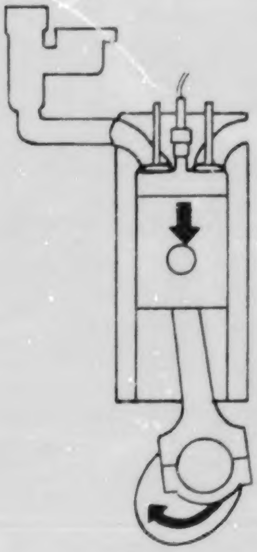
INTAKE

uel-air mixture is rawn into cylinder rom carburetor hrough open ntake valve by own-stroke of iston.



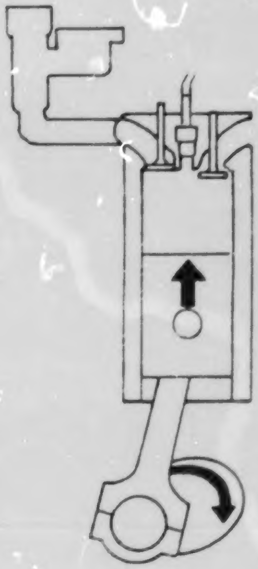
COMPRESSION

Mixture is compressed by up-stroke of piston. Both intake and exhaust valves are closed.



POWER

Compressed mixture is ignited by spark plug and expanding gases force piston to bottom of cylinder. Valves remain closed.



EXHAUST

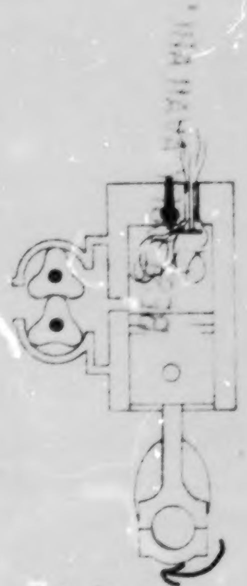
Piston on up-STROKE forces BURNT [redacted] gases from cylinder through open exhaust valve.

BEST COPY AVAILABLE

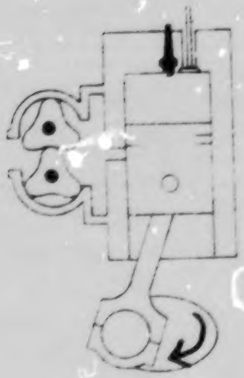
INSTRUCTION SHEET FOR ENABLING OBJECTIVE

number ☐

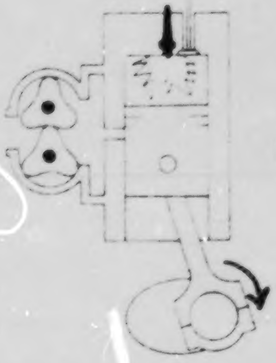
Two Stroke Cycle Operation



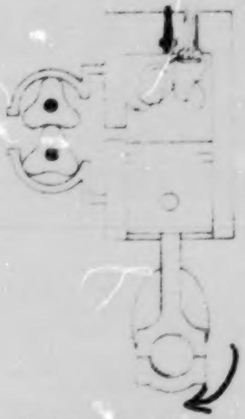
69 intake



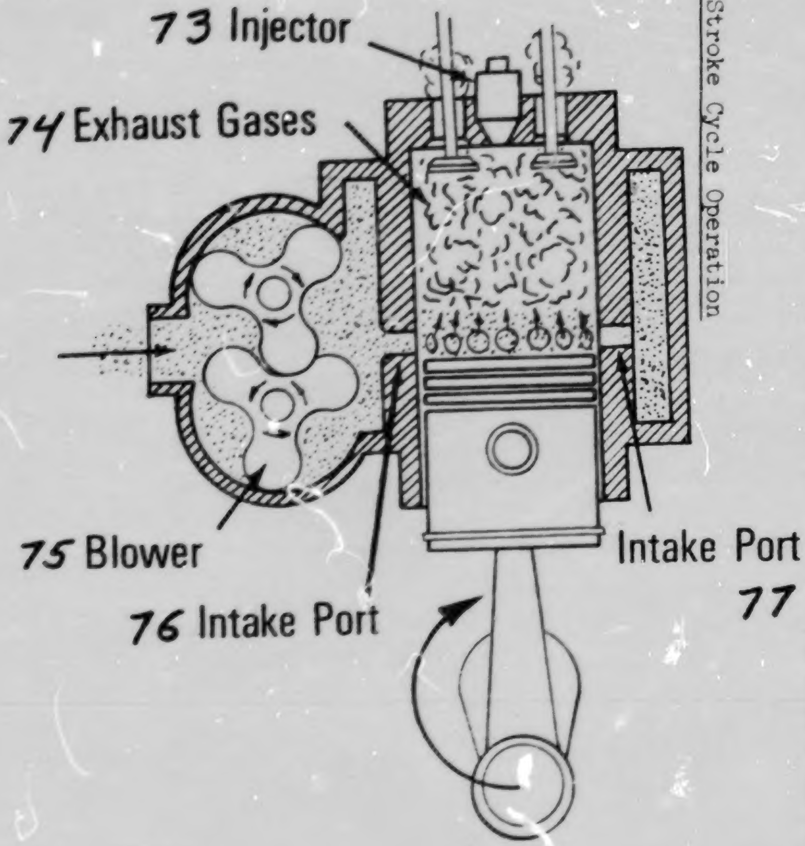
70 Compression



71 Power



72 Exhaust


73 Injector
74 Exhaust Gases
75 Blower
76 Intake Port
Intake Port
77

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DUTY	TASK	EN. OBJ.	DEPT.	PROG.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐ number PAGE 16 OF 17

DUTY

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Enabling objective

Identify one working cycle of a two and four cycle engine.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Use Resource No. 1 to identify one working cycle of a two and four cycle engine.	1. a. Text: Diesel Mechanics, pages 9-10. b. Instruction Sheet enclosed, Working Cycle of a Two and Four Stroke Engine c. TDST-4 Slide presentation.
2. Complete the Self-Check.	2. Self-Check enclosed.
3. When you think you can attain this task, take the Knowledge Test.	3. Knowledge Test for task

LIST OF RESOURCES, MATERIALS, AND EQUIPMENT

PAGE 17 OF 17

DUTY

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Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977

KNOWLEDGE TEST FOR ☐ ☐☐

duty task number

PAGE 1 OF 6

DUTY

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PROG.

TASK Describe Principles of 2 and 4 Cycle Diesel and Gasoline Engines

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate sheet of paper.

DO NOT MARK ON THIS TEST!

The items below are Matching. Use a No. 2 pencil to fill in completely the lettered box correxponding to your answer. For example, if you believe the correct answer relates to item c, fill in box c as follows:

Example: a b c d e

To change your answer, erase completely and re-mark. Only one answer will be considered correct.

1. Total space between the piston at its lowest position in the cylinder and the bottom of the cylinder head.
2. Total space between the piston at its highest position in the cylinder and the cylinder head.
3. The reduction in volume of gases trapped in the cylinder by the upward motion of the piston.
4. Ratio of whole cylinder volume to least cylinder volume.
5. Ignition of the fuel by the heat from compression.
6. Measure of heat intensity.
7. Action or operation of burning.
8. Cavity in the cylinder head of some diesels where some burning of fuel first takes place.
9. Piston at highest point of travel.
10. Piston at lowest point of travel.
11. Distance the piston moves when traveling from TDC to BDC.
12. Crankshaft revolutions per minute.

a. piston crown

b. power control

c. engine speed

d. stroke

e. BDC (Bottom Dead Center)

a. TDC (Top Dead Center)

b. combustion

c. pre-combustion chamber

d. compression

e. temperature

a. compression ignition

b. compression ration

c. volume

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED — duty — task number

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DUTY | TASK | DEPT. | PROG.

13. Controlling the engine power by varying or governing the amount of fuel injected into the combustion chamber.

14. Surface shape of the top of the piston.

15. Series of events that repeat themselves in a regular sequence.

d. cycle

e. clearance volume

The answers for items 16-27 appear below.

16. Solid casting which includes the cylinders and water jackets.

17. Holes in the cylinder block containing the pistons.

18. Movable plugs open at one end which transfer force of explosion to the connecting rod.

19. Connecting link between the piston and the crankshaft.

20. Main shaft of an engine which, turned by the connecting rods, changes the reciprocating motion of the piston to the rotary motion in the power train.

21. Drives the camshaft or idler gear.

22. Shaft with cam lobes used to operate the valves.

23. Gear by which the camshaft is driven by the crankshaft.

24. Eccentrics on the camshaft that operate the valves.

25. Rod links that transfer motion from the lifter to the rocker arm.

26. Transfers motion from push rod to valve to open the valves.

27. Rides on the camshaft so that the cam lobe raises it to operate the valve.

a. valve lifter

b. connecting rod

c. crankshaft

d. push rods

e. rocker arm

a. timing gear

b. cylinders

c. cylinder block

d. cam lobes

e. pistons

a. crankshaft gear

b. camshaft

The answers for items 28-36 appear below.

28. Opens and allows exhaust gases to be forced from engine cylinder.

29. Metal section bolted to the block to close one end of the cylinder, which usually contains the valves.

30. Provides pressure that circulates oil to rotating or reciprocating engine parts to minimize friction.

c. valves

d. oil pan

e. flywheel

a. oil pump

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

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DUTY TASK DEPT. PROG.

31. Serves as floating connecting piece for piston and connecting rod.

32. Hollow space in block through which coolant circulates.

33. Reservoir for engine oil.

34. Permits air to enter the cylinder.

35. Open and close the cylinder to allow air to enter or gases to leave the cylinder.

36. Attaches to the end of the crankshaft and provides inertia to carry the crankshaft around from one firing impulse to the other.

b. intake valve

c. cylinder head

d. exhaust valve

e. cooling passageway

a. wrist pin

The items below are Identification. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. Distinguish between the differences in diesel engines and gasoline engines by placing a "D" next to the descriptions of diesel engines and an "A" next to the description of gasoline engines. To change your answer, erase completely and re-mark.

37. ignition by compression

38. burns gasoline

39. lighter construction

40. high compression ratio

41. heavier construction

42. takes fresh air directly to combustion chamber

43. ignition by electrical spark

44. low compression ratio

45. burns low grade fuel oil

46. fuel and air mixture drawn through carburetor and intake manifold into combustion chamber

47. takes fresh air and fuel through carburetor then to combustion chamber

48. fuel injected directly into combustion chamber

DUTY

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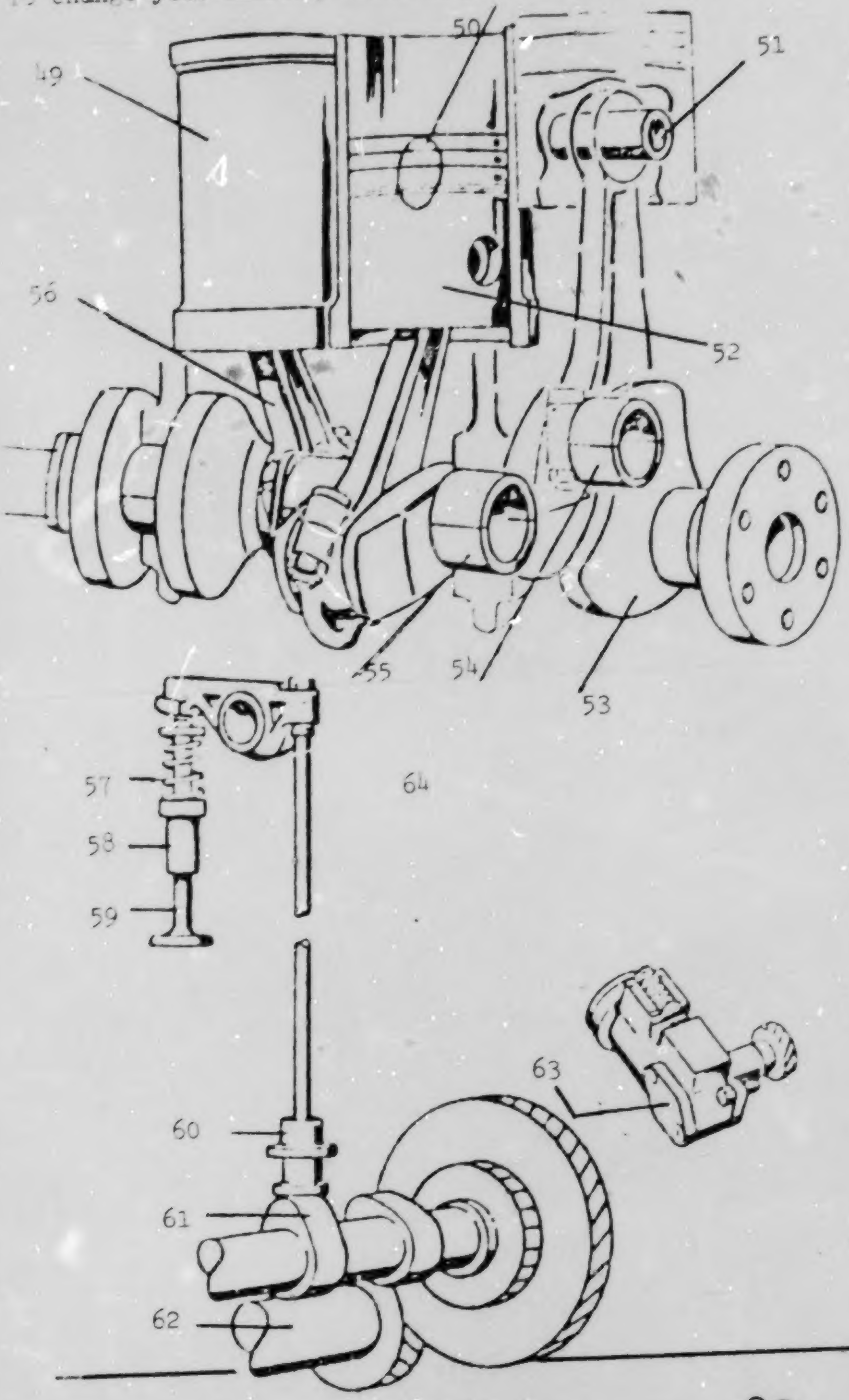
DEPT.

PROG.

he items below are Matching. Use a No. 2 pencil to fill in completely the lettered ox corresponding to your answer. For example, if you believe the correct answer elates to box c, fill in box c as follows:
xample: a b c d e
o change your answer, erase completely and re-mark.



a. webb
b. piston
c. cylinder
d. main bearing
e. rod bearing
a. rings
b. push rod
c. valve
d. valve spring
e. rocker arm
a. valve spring retainer
b. hour meter
c. crankshaft
d. cam
e. valve lifter or cam follower
a. connecting rod
b. wrist pin
c. cylinder head

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE 5 OF 6

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PROG.

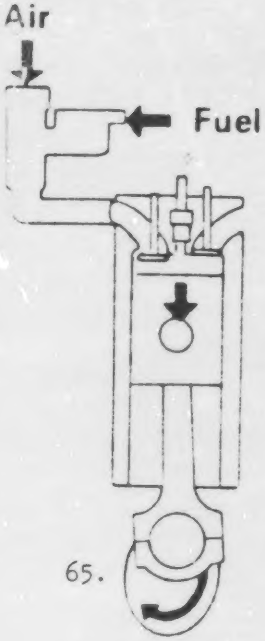
The items below are Matching. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example, if you believe the correct answer relates to box c, fill in box c as follows:

Example: a b c d e

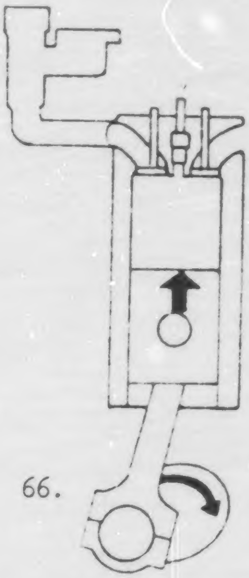
To change your answer, erase completely and re-mark.

Indicate the correct stroke for each picture below.

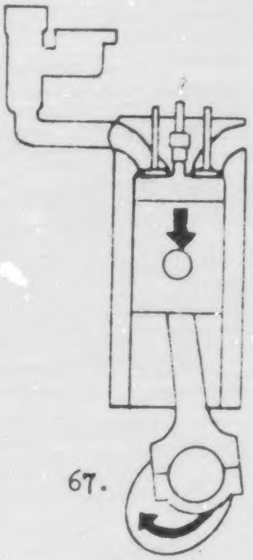
a. blowing
b. compression
c. exhaust
d. intake
e. power



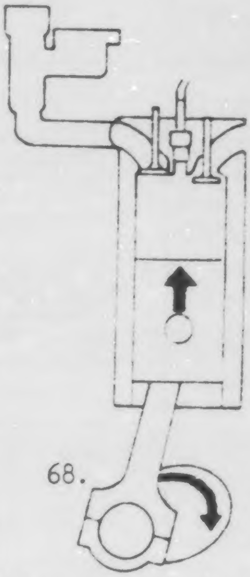
65.



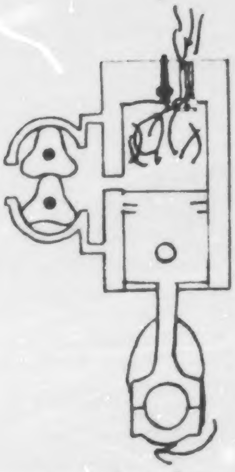
66.



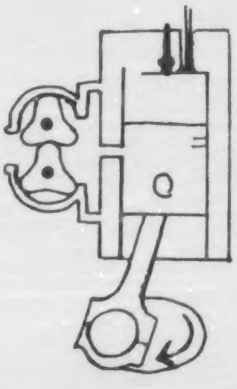
67.



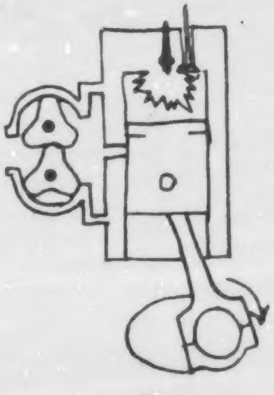
68.



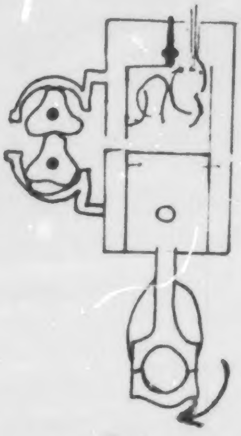
69. Intake



70. Compression



71. Power



72. Exhaust

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 6 OF 6

DUTY

TASK

DEPT.

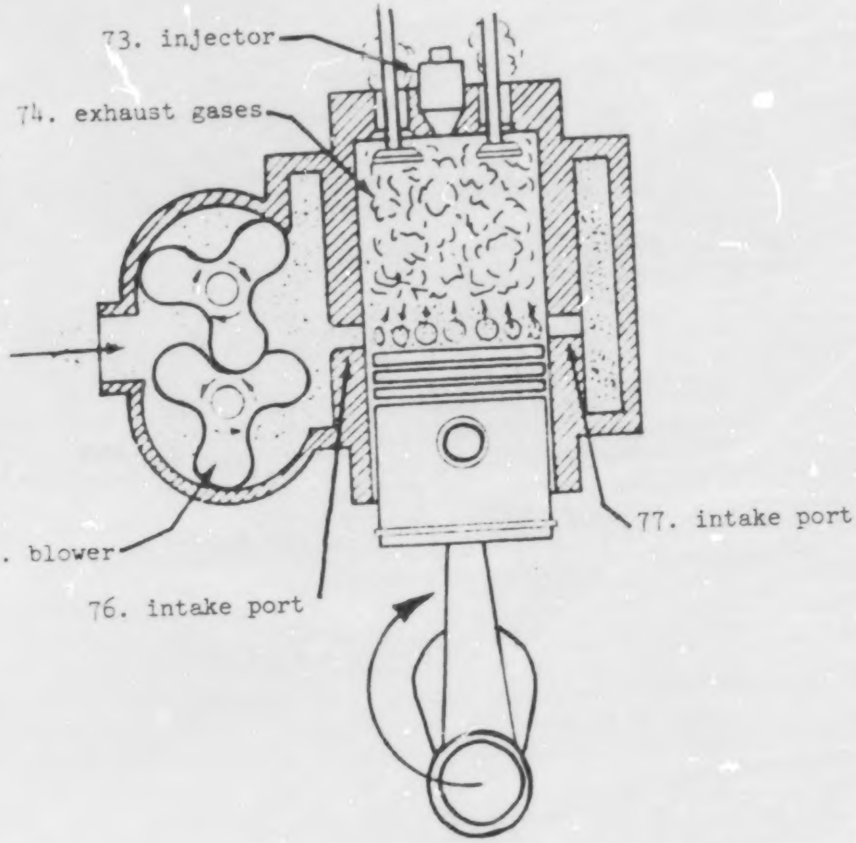
PROG.

he items below are True-False. Use a No. 2 pencil to completely fill in the lettered ox corresponding to your answer. For example, if you believe the correct answer is rue, fill in box a, if you believe the correct answer is False, fill in box b as ollows:

xample: a ■ c d e

To change your answer, erase completely and re-mark.

ndicate whether the names shown on the figure below are correct or incorrect.


73. injector
74. exhaust gases
75. blower
76. intake port
77. intake port

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DEISEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 0 5 Identify Vises and Clamps

PURPOSE:

You, as a good mechanic, will in most cases own your own tools and take great pride in them. As you progress in the mechanic's trade, you will be constantly adding to your collection. Due to the large number of tools that you will own, and also come in contact with, it is important that you know their names and how each tool should be used. Improper use of any tool can damage the tool itself and can also cause injury to you or the engine you are working on. It has been said that there is a tool made for every job, so by using the proper tool or tools, you will be able to improve both the quality and speed of any repair.

PLEASE DO NOT WRITE IN LEARNING GUIDE

DUTY
TASK
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Boynton Beach, Florida 33435

West Technical Education Center
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Belle Glade, Florida 33430

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Wilma McCarty, Curriculum and Staff Development Specialist

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DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(include condition, performance, and standard)

GIVEN: the proper material,

YOU WILL: use vises and clamps.

HOW WELL: You must successfully complete the Knowledge Test.

ENABLING OBJECTIVES:

1. Identify vises.
2. Identify clamps.

Bench Vise

Vises and clamps are probably the most useful utility tools in the shop. They will act as an extra pair of hands.

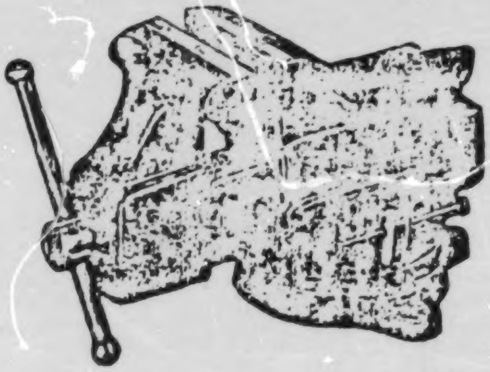

Figure 1: Bench Vise

Figure 1: The base of the vise is usually bolted to the bench. Most vises have a swivel base so that the jaws can be turned in any horizontal direction. The stationary jaw of the vise is a part of the swivel base. The movable jaw is attached to a heavy slide bar and is moved by means of a screw which is formed in the shaft of the handle. Turning the handle in a clockwise direction will draw the jaws together--and further turning will tighten the jaws and securely hold whatever material is placed between them. To open the jaws, turn the handle in a counterclockwise direction.

Ordinarily, the jaws of a bench vise are made of hardened steel which would normally mar finished surfaces of softer materials. To avoid damage to the parts you clamp in the vise, you can install "soft jaws" over the regular jaws. Soft jaws are made of sheet brass, copper, lead, zinc, or almost any other soft metal.

The only care a vise needs is an occasional cleaning and oiling of the screw threads and the slide bar. A vise can even out-wear its jaws because when they become badly worn you need only install a new set. But here's a caution: Don't use a vise as an anvil. In other words, don't lay objects on the jaws or the slide bar and pound on them. Any good vise will take a lot of punishment, but not the heavy, hammering kind which you would do on an anvil. Never put a pipe on the handle to tighten the vise.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐ number

PAGE 5 OF 9

DUTY TASK EN. OBJ. DEPT. PROG.

Enabling objective

Identify vises.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 to identify the different types of vises.	1. a. Instruction Sheet enclosed, Bench Vise b. Text: Diesel Mechanics Figure 47-7, page 370, "Bench vise and pointers for using bench vise".
2. Go on to Enabling Objective No. 2.	

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐ number

PAGE 6 OF 9

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

Enabling objective:

Identify clamps.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the types of clamps.	1. Instruction Sheet enclosed, Clamps
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. When you think you can attain this task take the Knowledge Test.	3. Knowledge Test

DIRECTIONS:

Evaluate your knowledge by answering True or False to the items below on a separate sheet of paper.

1. To hold an article securely in a vise you should use a peice of pipe on the vise handle.
2. To hold an article securely in a vise you should use a hammer to tighten the handle.
3. To open jaws on a vise you turn the handle in a clockwise direction.
4. To hold two or more parts together a "C" clamp can be used.
5. A pair of vise grip or self-locking pliers are a form of clamp.

Now check your answers with the Answer Key.

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

1. False
2. False
3. False
4. True
5. True

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LIST OF RESOURCES, MATERIALS, AND EQUIPMENT PAGE 9 OF 9

DUTY

TASK

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977.

KNOWLEDGE TEST FOR ☐ ☐☐

duty task number

PAGE 1 OF 2

DUTY

TASK

DEPT.

PROG.

TASK: Identify Vises and Clamps

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example if you believe the correct answer relates to box c, fill in box c as follows: ☐ ☐ ■ ☐
To change your answer, erase completely and re-mark.

1. Vises and clamps have one thing in common, they:

   a. both have a cutting action.
   b. act as an extra pair of hands.
   c. are all fastened to a work bench.
   d. are all used as a wand.

2. The base of a vise is usually bolted to:

   a. the floor.
   b. the wall.
   c. the bench.
   d. a pedestal.

3. All bench vises have:

   a. pair of stationary jaws.
   b. soft jaws.
   c. stationary and movable jaws.
   d. pair of movable jaws.

4. To tighten the jaws of a vise you turn the:

   a. jaws.
   b. swivel base.
   c. vise.
   d. screw shaft handle.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 2 OF 2

DUTY

TASK

DEPT.

PROG.

5. Ordinarily the jaws of a bench vise are made of:

   a. wood.
   b. hardened steel.
   c. iron.
   d. brass.

6. When the jaws of a vise wear out, you replace the:

   a. vise.
   b. slide bar.
   c. jaws.
   d. base.

7. The only care a bench vise needs is to occasionally oil the:

   a. fixed jaw.
   b. screw threads and slide bar.
   c. stationary jaw.
   d. base.

8. The type of clamp used to complete electrical connections is the:

   a. ground clamp.
   b. spring clamp.
   c. metal vise grip.
   d. vise.

9. The type of clamp that has four fingers is:

   a. sheet metal vise grip.
   b. "C" clamp vise grip.
   c. welding vise grip.
   d. mechanical fingers.

10. The chain clamp vise grip is used more to hold:

   a. flat objects to a bench.
   b. round tubular objects.
   c. square to flat surfaces.
   d. round objects to a bench.

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STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: ☐ COMPLETING CORE CURRICULUM

TASK: ☐ ☐ Identify Power Tools

PURPOSE:

Mechanics take great pride in their tools and ususally know how each should be used. The improper use of a tool may damage the tool or injure the mechanic. This learning guide will identify the correct procedures for using power tools.

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TASK
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OBJECTIVES

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to tools,

YOU WILL: identify power tools.

HOW WELL: You must successfully complete the Knowledge Test.

Your performance will be assessed by your instructor using the Performance Standards on page 11.

ENABLING OBJECTIVES:

1. Identify air tools.
2. Identify electric tools.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐ number

PAGE 4 OF 12

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

Enabling objective:

Identify air tools.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the types of air tools.	1. Instruction Sheet enclosed, Air Tools
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. Go on to Enabling Objective No. 2.	

Air Tools

The portable power air is one of the most important and versatile tools to a tradesman. Power tools are designed to be used anywhere when needed to do a specific job. The portable power drill is one tool that is used for many different types of operations with various attachments. Some of the operations that can be performed with the portable drill are listed below:

- cleaning with a wire wheel
- drilling holes with a drill bit
- cutting holes with a hole saw
- grinding with a rotary grinding wheel

The following lists the specific advantages of air tools.

1. The air tool speed and power can be regulated from stop, slow, to high speed just by turning the speed control knob on the side of the tool or by the amount of pressure applied to the trigger.

2. The air tool may be used near water without fear of electrocution.

3. Using air tools reduces the cost of operation.

4. Repair of air tools compared to its electric counterpart is almost nil.

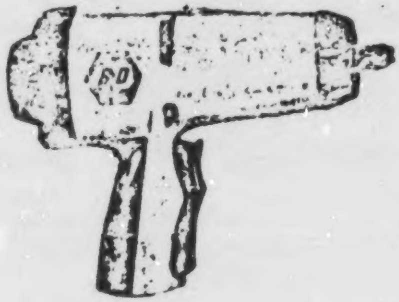
5. The air tool is compact compared to its' electric counterpart.

6. The air tool is rugged and breakage is held to a minimum.

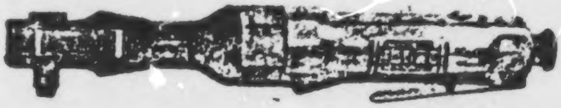
7. The only care required for the air tool is to keep it clean and oil it lightly after each days use.

When an air drill is used the tool is stalled out (putting too much applied pressure against the tool). This will not harm the air tool. If it were an electric tool this would cause a condition known as overloading and cause the electric wire windings to burn and short out inside the motor rendering the tool useless.

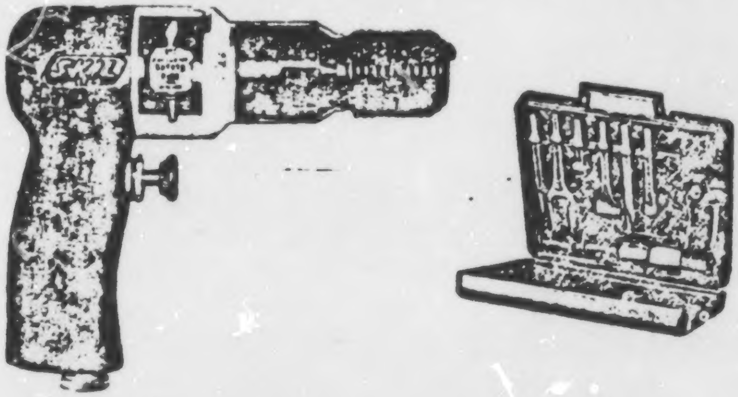
Some common air tools are shown below:



An impact air wrench is used for removing nuts and bolts. This wrench comes in three sizes: 3/8" drive, 1/2" drive and 3/4" drive for heavy work.



An air power ratchet wrench is used for close quarter work. This type of wrench is used for removing bolts (unwinding). This wrench is not used to tighten bolts to their peak tension.



An air impact chisel is one very important tool used by sheet metal workers and mechanics. This tool has a number of different attachments that give it a wide range of used.

Instruction Sheet prepared by Joe Harrison, Roy Poling and Glenn Rosenberger.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number

PAGE 7 OF 12

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify electric tools.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying electric tools.	1. a. Text: Diesel Mechanics, page 369. b. Instruction Sheet enclosed, Using Power Tools
2. Complete the Self-Check.	2. Self-Check enclosed.
3. When you think you can attain this task, take the Knowledge Test.	3. Knowledge Test
4. When you successfully complete the Knowledge Test, take the Performance Test.	4. Performance Test

INSTRUCTION SHEET FOR ENABLING OBJECTIVE 2 number

PAGE 8 OF 12

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Using Power Tools

Chuck the drill tightly. Center punch the spot to be drilled. After the drill has started, apply a small quantity of cutting oil. The oil will make the cutting easier, faster and will lengthen the life of the drill. When drilling thin body metal, oil is not required. Oil is not needed on cast iron.

Hold the drill at the proper angle and apply enough pressure to achieve good cutting. When the drill is ready to break through the work let up on the pressure to avoid grabbing. Always securely fasten the piece to be drilled. On thin metal hold the work down as well as keeping it from turning. The piece of work may attempt to "climb" up the drill.

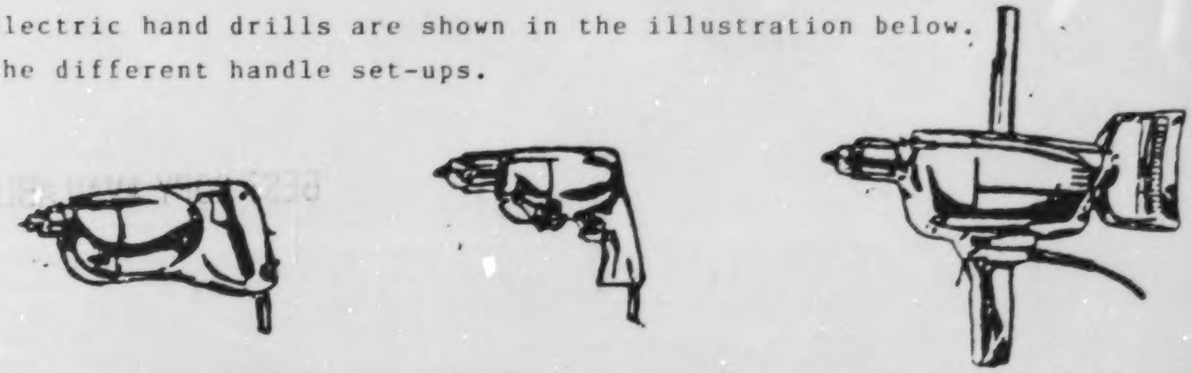
Safety Hints

1. Large electric hand drills develop considerable torgue. Be sure you have a firm grip on the drill before engaging it.
2. Never install or remove a drill in a chuck without unplugging the cord. If it is accidentally started when you are grasping the drill or the chuck key you could be injured.
3. Keep loose clothing (sleeves, pant legs, ties, scarves, etc.) away from the drill.
4. Always secure the work firmly. If the drill grabs and the work is loose, the work may swing around with a vicious cutting force.

CAUTION: BE SURE TO WEAR GOGLES WHEN GRINDING WITH A DRILL!

5. Never use a power tool that is not properly grounded.
6. Never use a power tool when standing on wet ground.

Electric hand drills are shown in the illustration below. Note the different handle set-ups.



Instruction Sheet prepared by Joe Harrison, Roy Poling and Glenn Rosenberger.

SELF-CHECK FOR ENABLING OBJECTIVE 2 number PAGE 9 OF 12

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

DIRECTIONS:

Evaluate your knowledge by answering True or False to the items below on a separate sheet of paper.

1. When using electric powered hand tools always try to keep lead cord length to a minimum.
2. Never use electric powered hand tools if your feet are wet.
3. An impact wrench should be used to remove and replace engine cylinder heads.
4. When drilling a piece of metal, the metal should be securely held by a vise or other means.
5. Electric drills can be used to operate reamers as well as taps and dies.

Now check your answers with the Answer Key.

SELF-CHECK FOR ENABLING OBJECTIVE 2 number
ANSWER KEY

PAGE 10 OF 12

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

1. True
2. True
3. False
4. True
5. True

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

PERFORMANCE TEST FOR ☐ duty ☐☐ task number

PAGE 11 OF 12

DIRECTIONS:

Given access to tools you will idenitfy power tools. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Were safety glasses worn, when necessary?		
2. Was a 1/2" drill identified?		
3. Was a 1/2" hole drilled in a piece of steel following outlined instructions?		
4. Was specified air tool identified?		
5. Was a wheel installed on a vehicle using the air tool?		
6. Was a 3/8" impact wrench identified?		
7. Was an impact chisel used to cut out a few rivets from a sheet of steel?		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained
☐ Not attained

EVALUATOR

DEPT.

PROG.

LIST OF RESOURCES, MATERIALS, AND EQUIPMENT

PAGE 12 OF 12

DUTY

TASK

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977.

KNOWLEDGE TEST FOR ☐ ☐☐
duty task number

PAGE 1 OF 2

DUTY

TASK

DEPT.

PROG.

TASK:

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example if you believe the correct answer relates to box c, fill in box c as follows: ☐ ☐ ■ ☐
To change your answer, erase completely and re-mark.

1. The most widely used power tool in the field is the:

    a. air tool.
    b. electric tool.
    c. hand tool.
    d. portable tool.

2. The most used power tool by the mechanics is the:

    a. portable tool.
    b. air tool.
    c. electric tool.
    d. hand tool.

3. The most versatile tool used by the mechanics is the:

    a. impact wrench.
    b. drill.
    c. buffer.
    d. sander.

4. The impact wrench is used to:

    a. drill holes.
    b. polish surfaces.
    c. loosen and remove nuts and bolts.
    d. grind surfaces.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 2 OF 2

DUTY | TASK | DEPT. | PROG.

5. The air ratchet wrench is used to remove nuts and bolts:

   a. from engine cylinder heads.
   b. from tight quarters.
   c. that are very tight.
   d. that can also be removed with the impact wrench.

6. When cutting holes, a hole saw is attached to a/an:

   a. impact wrench.
   b. grinder.
   c. drill.
   d. buffer.

7. When using an electrical tool the advantage is the:

   a. power source is readily available.
   b. tool has more power.
   c. tool runs cooler.
   d. tool is more compact in size.

8. The biggest advantage when using an air tool for a long period of time is:

   a. the compactness of the tool.
   b. the cost of the tool.
   c. the tool runs cooler in temperature.
   d. that it doesn't need to be oiled frequently.

9. The reason for a third prong on the electrical plug is because it:

   a. holds the plug better in the socket.
   b. make a stronger wire.
   c. is the ground connection for the tool to prevent electrocution.
   d. is the ground for the electrical circuit.

The items below are True-False. Use a Nol 2 pencil to completely fill in the lettered box corresponding to your answer. For example, if you believe True is the correct answer fill in box a, if you believe False is the correct answer fill in box b as follows:
Example: ☐ ■ ☐ ☐
To change your answer, erase completely and re-mark.

1. The air ratchet is used to tighten bolts to their peak tension.

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 0 7 Identify Fasteners

PURPOSE:

Fasteners are one of the three methods used to join metal pieces together. The greatest advantage to bolts and screws as fasteners is that the pieces can be taken apart and reassembled without damage. You will become familiar with the similarities and differences between the various fasteners.

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THE SCHOOL BOARD OF PALM BEACH COUNTY

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OBJECTIVES

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(include condition, performance, and standard)

GIVEN: access to fasteners,

YOU WILL: identify fasteners.

HOW WELL: You must successfully complete the Knowledge Test.

Your performance will be assessed by your instructor using the Performance Test on page 7.

ENABLING OBJECTIVES:

1. Determine types and uses of fasteners.
2. Practice identifying fasteners.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE

1 number

PAGE 4 OF 9

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

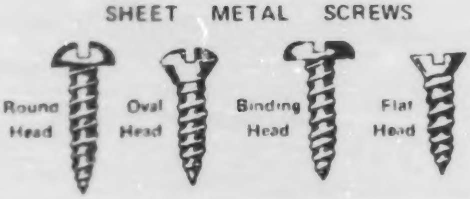
Enabling objective

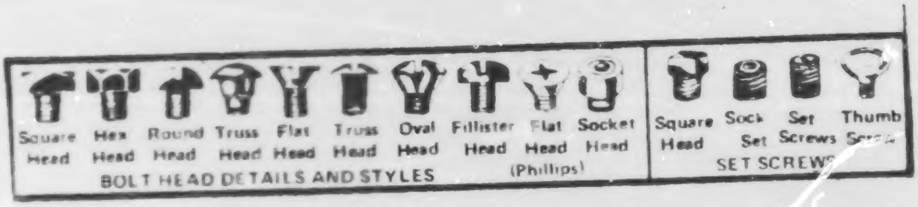
Determine types and uses of fasteners.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the various types of fasteners.	1. a. Text: Diesel Mechanics, Unit 19, pages 378-385. b. Instruction Sheet enclosed, Types of Screws and Screw Heads c. Slide presentation - TDST-2, "Torque and Tension".
2. As a Self-Check, complete Resource No. 2. Check your answers using the textbook, pages 378-385.	2. Text: Diesel Mechanics, page 385, Questions 1, 3, 5, 8, 9, 11-14, 17, and 18.
3. Go on to Enabling Objective No. 2.	

Types of Screws and Fasteners


SHEET METAL SCREWS
Round Head
Oval Head
Binding Head
Flat Head


Square Head
Hex Head
Round Head
Truss Head
Flat Head
Truss Head
Oval Head
Fillister Head
Flat Head (Phillips)
Socket Head
BOLT HEAD DETAILS AND STYLES
Square Head
Sock Set
Set Screws
Thumb Screw
SET SCREWS

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LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number PAGE 6 OF 9

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Practice identifying fasteners.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1 practice identifying fasteners.	1. Identification Kit: Fasteners.
2. When you think you can attain this task, take the Knowledge Test.	2. Knowledge Test for task
3. When you successfully complete the Knowledge Test take the Performance Test.	3. Performance Test for task

PERFORMANCE TEST FOR ☐ ☐☐

duty task number

PAGE 7 OF 9

DIRECTIONS:

Given access to capscrews, bolts, nuts, washers, lock washers, sheet metal screws, cotter pins, roll pins, clevis pins, snap rings, locking devices, and other types of fasteners you will select those indicated by your instructor. You will be evaluated for attainment of this task, based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was #5 grade machine capscrew identified?........		
2. Was U.S.S. thread identified?........		
3. Was SAE thread identified?........		
4. Was wing nut identified?........		
5. Was castellated nut identified?........		
6. Was high nut identified?........		
7. Was Pec nut, locknut identified?........		
8. Was wood ruff key identified?........		
9. Was roll pin identified?........		
10. Was cotter pin identified?........		
11. Was press fit pin identified?........		
12. Was flat key stock identified?........		
13. Was Phillips head screw identified?........		
14. Was inside snap ring identified?........		
15. Was outside snap ring identified?........		
16. Was sheet metal screw identified?........		
17. Was groove tapered pin identified?........		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained

☐ Not attained

EVALUATOR

DEPT.

PROG.

PERFORMANCE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 8 OF 9

PERFORMANCE STANDARDS

ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
18. Was nylon collar nut identified?............		
19. Was square machine screw nut identified?............		
20. Was rocker shaft bolt identified?............		
21. Was 3/8" bolt identified?............		
22. Was 1/4" bolt identified?............		
23. Was 5/16" bolt identified?............		
24. Was 1/2" bolt identified?............		
25. Was 9/16" bolt identified?............		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained
☐ Not attained

EVALUATOR

DEPT

PROG.

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Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw-Hill Inc., New York, 1977.

KNOWLEDGE TEST FOR ☐ duty ☐☐ task number

PAGE 1 OF 5

DUTY

TASK

DEPT.

PROG.

TASK: Identify Fasteners

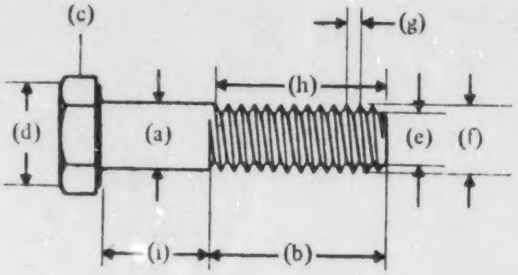
DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example, if you believe the correct answer relates to box c, fill in box c as follows:
Example: ☐ ☐ ■ ☐
To change your answer, erase completely and re-mark.

Using the figure below answer items 1-4.



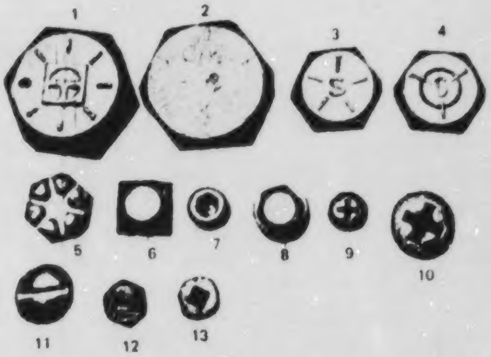
1. Letter a refers to:
    - a. inside diameter.
    - b. head length.
    - c. outside diameter.
    - d. P.S.I.

2. Letter e refers to:
    - a. inside diameter.
    - b. torque angle.
    - c. outside crest.
    - d. root of the threads.
    - e. none of the above.

3. Letter b refers to:
    - a. thread class.
    - b. angle design.
    - c. thread root.
    - d. thread length.
    - e. all of the above.

4. Letter f refers to:
    - a. major diameter.
    - b. angle design.
    - c. inside diameter.
    - d. outside crest.

Use the figure below to answer items 5-7.



5. Capscrew head No. 3 would be a ________ grade capscrew.

   a. 1
   b. 3
   c. 5
   d. 7
   e. 9

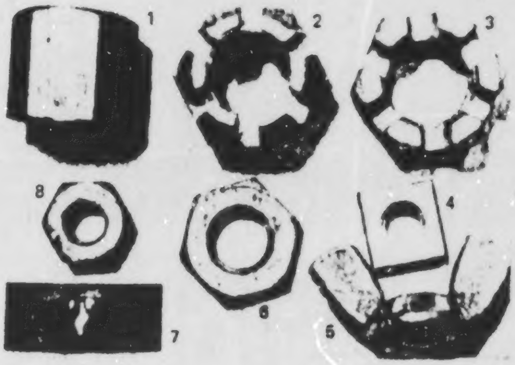
6. Capscrew head No. 2 would be a ________ grade capscrew.

   a. 2
   b. 4
   c. 6
   d. 8
   e. 10

7. The head of capscrew No. 4 would be considered a__________ head screw.

   a. hex.
   b. square.
   c. round.
   d. oblong.
   e. triangle.

Use the figure below to answer items 8-9.



8. No. 2 is a:

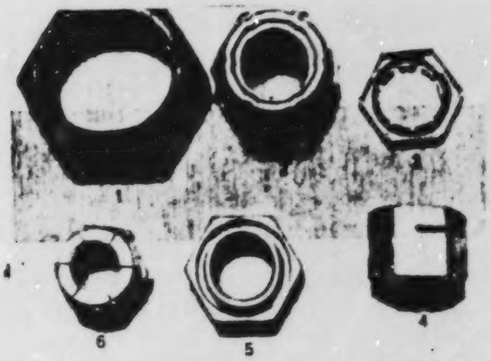
   a. hex castle nut.
   b. wing nut.
   c. spring nut.
   d. jam nut.
   e. wal nut.

DUTY
TASK
DEPT.
PROG.

9. No. 5 is a:

a. jam nut.
b. flat nut.
c. hex nut.
d. wing nut.

Use the figure below to answer items 10-11.



10. No. 2 is called a:

a. marsden nut.
b. nylon collar locknut.
c. distorted thread nut.
d. self-loosening nut.
e. paper nut.

11. No. 3 is called a:

a. flexible nut.
b. marsden nut.
c. thin nut.
d. pal nut locknut.
e. lockwasher nut.

12. The purpose of a nut is to:

a. clean the threads.
b. keep the bolt at the specified tension.
c. keep the bolt from rusting.
d. fit a box wrench.
e. fit a screw.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE 4 OF 5

DUTY | TASK | DEPT. | PROG.

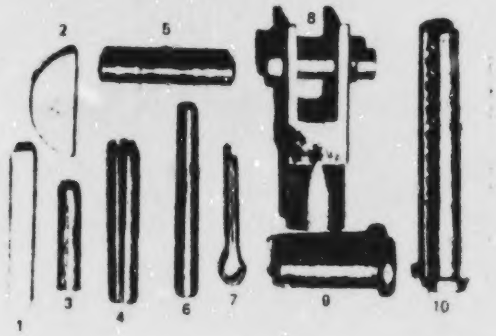
The items below are True-False. Use a No. 2 pencil to completely fill in the lettered box corresponding to your answer. For example, if you believe True is the correct answer fill in box a, if you believe False is the correct answer fill in box b as follows:
Example: ▭ ■ ▭ ▭

To change your answer, erase completely and re-mark.

13. Bolt grade is the tensil strength of the material?

14. A lockwasher should be used to prevent a bolt or nut from tightening too much.

Use the figure below to answer items 15-19.



15. No. 2 is a clevis pin.

16. No. 4 is a roll pin.

17. No. 7 is a clevis pin.

18. No. 9 is a rivet.

19. No. 5 is a press fit pin.

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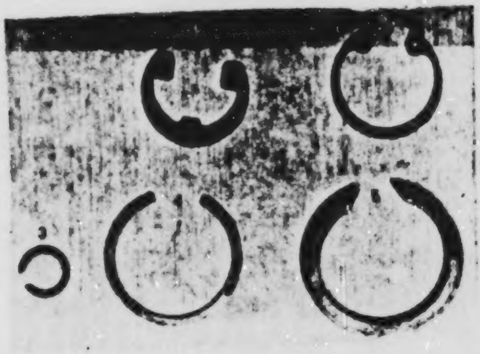
Use the figure below to answer items 20-24.



20. No. 1 is an external-finger snap ring.

21. No. 2 is an external snap ring.

22. No. 3 is an internal snap ring.

23. A metal lock should never be re-used.

24. The term USS refers to United System Standard.

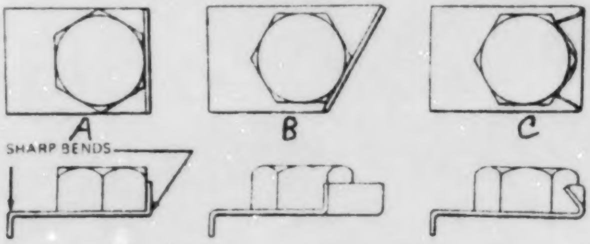
25. The size of a bolt is measured by the bolt diameter.

26. Bolt length is measured from the extreme end to the bearing surface of the head.

27. A 3/8" bolt usually requires the use of a 3/8" wrench.

28. Nuts generally do not have grade markings.

Use the figure below to answer item 29.



29. The correct method for installing a metal lock is shown in B.

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STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 0 8 Select Hammers, Chisels, and Punches

DUTY
TASK
PREREQ
DEPT.
PROG.
REVISED

DRAFT

PURPOSE:

You, as a mechanic, will probably own your own tools and take great pride in them. Due to the large number of tools that you will come in contact with, it is important that you know their names and how each tool should be used. It has been said that there is a tool made for every job, so by using the proper tool or tools, you will be able to improve both the quality and speed of any repair.

PLEASE DO NOT WRITE IN LEARNING GUIDE

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THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment Operations Instructor
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES PAGE 3 OF 16

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to snap-on or blackhawk tools.

YOU WILL: select hammers, chisels and punches.

HOW WELL: You must successfully complete the Knowledge Test.

ENABLING OBJECTIVES:

1. Identify the types of hammers, chisels, and punches.
2. Practice selecting hammers, chisels, and punches.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1 number

PAGE 4 OF 16

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify types of hammers, chisels, and punches.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 to identify the types of hammers.	1. a. Text: Diesel Mechanics, pages 357-358. b. Instruction Sheet enclosed, Types of Hammers
2. Read Resource No. 2 identifying the types of chisels and punches.	2. a. Text: Diesel Mechanics, pages 355, 356, and 358. b. Instruction Sheet enclosed. Types of Chisels and Punches
3. Evaluate your knowledge by completing the Self-Check. Check your answers using the text.	3. Text. Diesel Mechanics, pages 364-365, Questions 1, 2, 3, 10, 18.
4. Go on to Enabling Objective No. 2.	

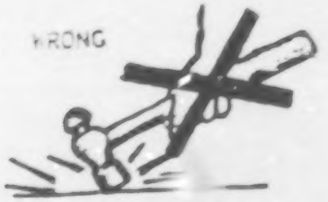
Types of Hammers

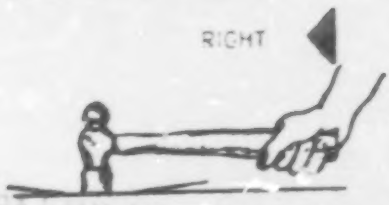
Many types of hammers are used in industrial occupations. Hammers are primarily used for bending, forming, driving, riveting, peening, pulling, etc. This learning guide will deal only with the types of hammers listed below:

1. Ball Peen Hammer
2. Brass Hammer
3. Sledge Hammer
4. Chipping Hammer
5. Picking Hammer
6. Dinging Hammer
7. Plastic-Tip Hammer
8. Rubber Mallet

There are several "do's and don'ts" to follow while using hammers. If you are going to use a hammer efficiently, you must learn how to hold it properly. Grasp the hammer near the end of its handle...place the head of the hammer on the object you want to strike...tap the object once or twice lightly...and then, when you are sure of your aim, heave at it.

Before using any hammer, make sure that the head is securely attached to the handle. A hammer head that flies off its handle can cause serious damage. Never strike a hardened-steel surface with a steel headed hammer because particles of the steel may break loose from the hammer or surface of the object and inflict damage. Please note the illustrations below.





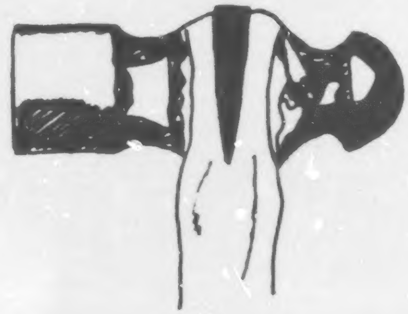


Figure 1 illustrates the ball peen hammer. This hammer has one face that is square (at right angles) to the end of the handle. The opposite end of the hammer head is rounded and is called the ball peen. The face of the hammer is used for normal hammering operations. The ball peen end of the hammer is used to form a rivet head or to make gaskets. Figure 1 is shown below.

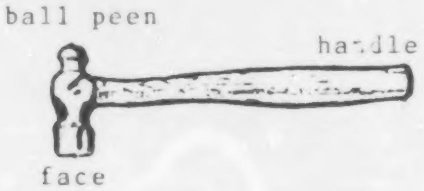


Figure 2 shows a brass hammer. This hammer has a head made of brass. The brass hammer is used for driving pilot pins and other materials that would be damaged or distorted by using a steel hammer. Figure 2 is shown below.

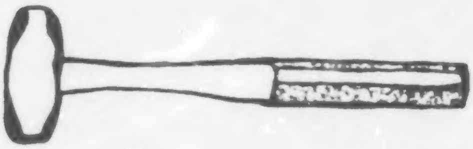


Figure 3 shows a dinging hammer. This hammer is used by the auto body trades to remove dents in sheet metal parts. The large face is used for metal finishing work. Figure 3 is shown below.

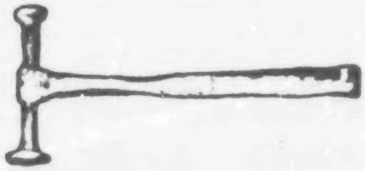


Figure 4 shows a plastic-tip hammer. This hammer has head tips made out of plastic. Plastic tips will not damage parts because the plastic is softer than the material being hammered. Plastic can absorb the force of the impacts instead of trasmitting them to the material. Figure 4 is shown below.

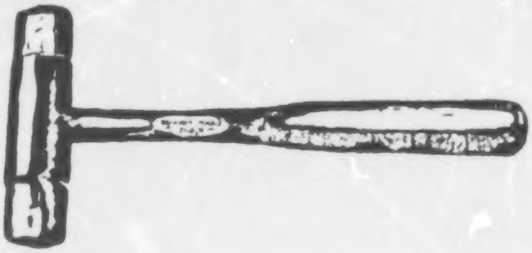


Figure 5 shows a rubber mallet. This hammer is the softest of all hammers, with the possible exception of leather or rawhide mallets. These are used to seat hub caps and wheel covers. They are soft enough to not harm the finish of the hub caps - and they save the heels of your hands while you're trying to seat hub caps. NOTE: Always use a softer hammer than the material you're working with. Figure 5 is shown below.

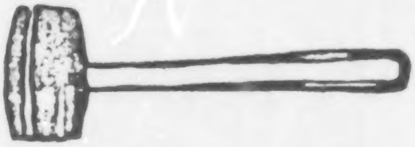


Figure 6 shows the picking hammer. This hammer is used by the auto body trades to remove small dents in sheet metal parts. The pointed end is used for picking out small dents and the round face is used for metal finishing work. Figure 6 is shown below.

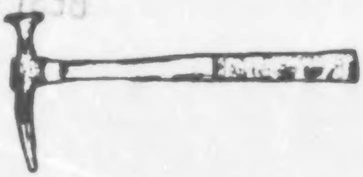


Figure 7 shows the sledge hammer. This hammer is designed in various sizes and weights, they are generally used when a heavy force is necessary. The striking face on one side is flat; on the other side the face is slightly rounded. Figure 7 is shown below.

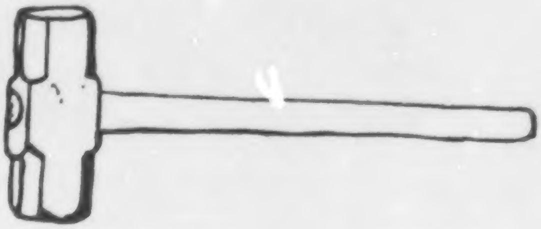
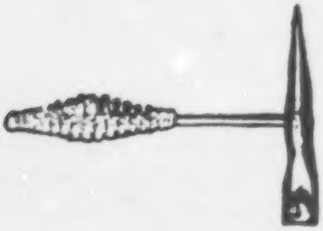


Figure 8 shows a chipping hammer. This hammer is used by the welding trades to remove slag which forms after the arc welding process. Figure 8 is shown below.



Instruction Sheet prepared by Mr. Harrison, Mr. Poling, and Mr. Rosenberger.

Types of Chisels and Punches

Chisels are grouped into four basic groups and are listed below:

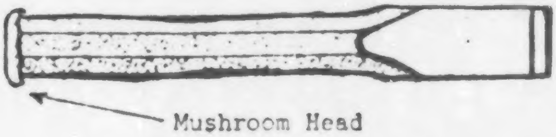
1. Flat Cold Chisel
2. Diamond Point Chisel
3. Cape Chisel
4. Round-Nose Chisel

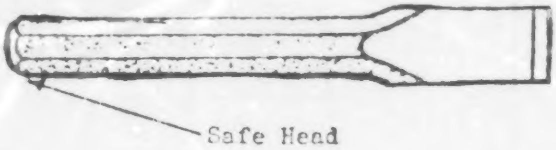
Punches are grouped into six basic groups and are listed below:

1. Center Punch
2. Prick Punch
3. Hole Punch
4. Drift Punch
5. Starting Punch
6. Pin Punch

Chisels and punches of many types are used in various industrial occupations. Each chisel and punch has its special use. A chisel is a wedge-shaped cutting tool used to cut, shear, and chip metal. One end is hardened and sharpened to make a good cutting edge. A punch is a tool for indenting, perforating, and driving. It is usually hardened to withstand wear.

Both ends of chisels and punches need attention from time to time. Heavy hammering "mushrooms" the upper end of chisels and punches. It is important to grind the head smooth, because the chips may fly off a mushroomed head and possibly cause injury. The lower end of chisels and punches also requires attention. On chisels, the hardened cutting edge should be sharp; punches of the pointed or blunt type also require sharpening or "dressing."





The following will identify the different types of chisels and give a brief description and illustration of each.

Figure 1 shows a flat cold chisel. This chisel is forged from round, square, or hexagon bars of tough carbon steel. These chisels are driven with a hammer, to cut or chip metal and for splitting nuts or rivets. Figure 1 is shown below.

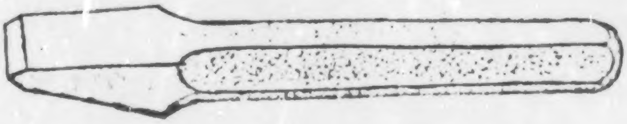


Figure 2 shows a diamond point chisel. This chisel is forged with a tapered shank of square section which is ground on an angle across diagonal corners. This results in a diamond shaped cutting edge. Diamond point chisels are used for cutting V-shaped grooves and for squaring up the corners of slots.

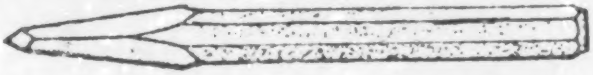


Figure 3 shows a cape chisel. This chisel has a cutting edge that is relatively narrower than the cutting edge of a flat chisel. The cape chisel is forged so that the cutting (double-bevel) edge is slightly wider than the shank so that it will not bind when used to cut a narrow groove. Cape chisels are used for narrow grooves, keyways, and square corners. Figure 3 is shown below.

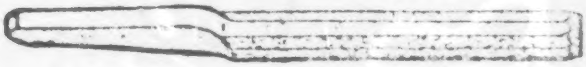
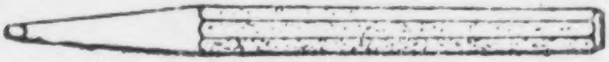


Figure 4 below shows a round-nose chisel. This chisel has a cutting edge with one bevel. It is used mostly for cutting semi-circular grooves and inside rounded-off corners. Figure 4 is shown below.



This portion of the student learning guide will identify the different types of punches and give a brief description and illustration of each.

Figure 5 shows a center punch. This punch is used to mark the centers of holes to be drilled. If the center punch is used correctly, the depression it makes in the metal will guide the point of the drill bit and keep it from "wandering." The center punch is a relatively short, hand-held steel tool with a hardened conical point ground to a 90° angle. Figure 5 is shown below.

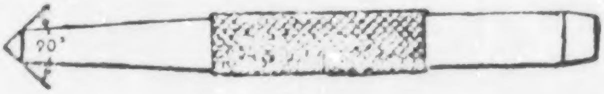


Figure 6 shows a prick punch. A prick punch is similar to a center punch, except that it's ground to a 60° angle. It is useful for close layout work. Figure 6 is shown below.

Figure 7 shows a hole punch. A hole punch is a round piece of hardened steel with a specified size hole in the center. The outside of the head is slightly tapered toward the handle. This punch is used to cut round holes in gasket material. Usually a smaller hole is drilled through the entire length of the handle to allow the cut blank (slugg) to be knocked out. Figure 7 is shown below.

Figure 8 shows a drift punch. Drift punches are usually made of brass and are used to drive out hard or highly finished parts without damaging them. They are not always tapered. Figure 8 is shown below.

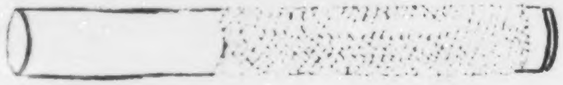


Figure 9 shows a starting punch. A starting punch is made with a shank that's tapered all the way to its end. As its name suggests, the starting punch is used to start the removal of pins and rivets. Because of the tapered design of its shank, it will not be able to follow all the way through. Figure 9 is shown below.

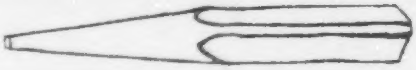
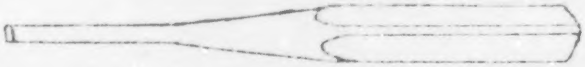


Figure 10 is a pin punch. Pin punches have straight shanks and are used to complete the removal of pins and rivets. In using pin punches, always remember that the slender, straight shank of a pin punch is more likely to break under heavy blows from a hammer. Always use the largest pin punches that will fit the hole. Figure 10 is shown below.



LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number

PAGE 13 OF 16

DUTY | TASK | EN. OBJ. | DEPT. | PROG.

Enabling objective

Practice selecting hammers, chisels, and punches.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1, practice selecting hammers, chisels and punches.	1. Identification Kit: Hammers, Chisels and Punches
2. When you think you can attain this task take the Knowledge Test.	2. Knowledge Test for task
3. When you successfully complete the Knowledge Test take the Performance Test.	3. Performance Test for task

BEST COPY AVAILABLE

PERFORMANCE TEST FOR ☐ ☐☐
duty task number

PAGE 14 OF 16

DIRECTIONS:

Given access to hammers, chisels, and punches, you will select those indicated by your instructor. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was ball peen hammer identified?		
2. Was brass hammer identified?		
3. Was dinging hammer identified?		
4. Was plastic-tip hammer identified?		
5. Was rubber mallet identified?		
6. Was picking hammer identified?		
7. Was sledge hammer identified?		
8. Was chipping hammer identified?		
9. Was flat cold chisel identified?		
10. Was diamond point chisel identified?		
11. Was cape chisel identified?		
12. Was round nose chisel identified?		
13. Was center punch identified?		
14. Was prick punch identified?		
15. Was hole punch identified?		
16. Was drift punch identified?		
17. Was starting punch identified?		
18. Was pin punch identified?		

DUTY
TASK
ATTEMPT
STUDENT
DATE
☐ Attained
☐ Not attained
EVALUATOR
DEPT.
PROG.

PERFORMANCE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 15 OF 16

PERFORMANCE STANDARDS

ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
19. Were hammers held using the technique shown on Instruction Sheet, "Types of Hammers"?................................		
20. Were all safety practices followed?...........................		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained

☐ Not attained

EVALUATOR

DEPT

PROG.

LIST OF RESOURCES, MATERIALS, AND EQUIPMENT PAGE 16 OF 16

DUTY

TASK

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977

KNOWLEDGE TEST FOR ☐ ☐☐ PAGE 1 OF 4

duty task number

DUTY

TASK

DEPT.

PROG.

TASK Select Hammers, Chisels, and Punches

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example if you believe the correct answer relates to box c, fill in box c as follows: ☐ ☐ ■ ☐
To change your answer, erase completely and re-mark.

1. When using a hammer, the proper method to grasp the handle is:

   a. close to the hand.
   b. in the center.
   c. near the end.
   d. with three fingers.

2. A hammer designed for heavy work is known as the:

   a. ball peen hammer.
   b. sledge hammer.
   c. engineers hammer.
   d. brass hammer.

3. Hub caps are generally installed by using a:

   a. rubber mallet.
   b. plastic hammer.
   c. sledge hammer.
   c. wood hammer.

4. When striking with any hammer, be sure that the face hits;

   a. sideways.
   b. flat.
   c. on the tip.
   d. at an angle.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE 2 OF 4

DUTY | TASK | DEPT. | PROG.

5. The most common hammer used in the welding trade is the:

   a. chipping hammer.
   b. slag hammer.
   c. welding hammer.
   d. ball peen hammer.

6. The most common hammers used in the auto body trade are the:

   a. ball peen and leather hammers.
   b. dolly hammers and rubber mallets.
   c. sledge and jack hammers.
   d. picking and dinging hammers.

7. The peen head of the ball peen hammer is used for:

   a. cutting gaskets.
   b. driving nails.
   c. peening balls.
   d. slag removal.

8. A steel headed hammer should never be used to strike a:

   a. soft steel surface.
   b. hardened steel surface.
   c. nail.
   d. piece of wood.

9. The wedge on a hammer handle is used to:

   a. increase leverage.
   b. wedge the head on.
   c. increase hammer life.
   d. increase hammer weight.

10. Most hammer handles are made of:

   a. plastic.
   b. rubber.
   c. steel.
   d. wood.

11. The condition which occurs to the soft end of a chisel after severe use is known as:

   a. cupping.
   b. mushrooming.
   c. overlapping.
   d. dulling.

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12. The point of a center punch is ground at a:

    a. 90° angle.
    b. 60° angle.
    c. 45° angle.
    d. 30° angle.

13. The point of a prick punch is ground at a:

    a. 90° angle.
    b. 60° angle.
    c. 45° angle.
    d. 30° angle.

14. Drift punches are usually made of:

    a. copper.
    b. brass.
    c. aluminum.
    d. rubber.

15. To remove a pin, first use a starting punch, then a:

    a. finishing punch.
    b. pin punch.
    c. hole punch.
    d. prick punch.

16. Hole punches are generally used to make:

    a. gaskets.
    b. holes in metal.
    c. holes in bumpers.
    d. holes in fenders.

17. When drilling a hole in metal, it is first useful to use a:

    a. drift punch.
    b. center punch.
    c. starting punch.
    d. pin punch.

18. The best chisel to use when splitting nuts would be a:

    a. cape chisel.
    b. round-nose chisel.
    c. diamond point chisel.
    d. flat cold chisel.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED

duty task number

PAGE 4 OF 4

DUTY

TASK

DEPT.

PROG.

19. The chisel which would cut a V-shaped groove is the:

    a. round-nose chisel.
    b. flat cold chisel.
    c. cape chisel.
    d. diamond point chisel.

20. The chisel which would cut a semi-circular groove is the:

    a. round-nose chisel.
    b. flat cold chisel.
    c. cape chisel.
    d. diamond point chisel.

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 0 9 Identify Screwdrivers, and Hand Tools

DUTY
TASK
PREREQ
DEPT.
PROG.
REVISED

DRAFT

PURPOSE:

As you progress in the mechanic's trade, you will be adding to your tool collection. Due to the large number of tools that you will own, and also come in contact with, it is important that you know their names and how each tool should be used. Improper use of any tool can damage the tool or engine and may cause injury to you. It has been said that there is a tool made for every job, so by using the proper tool or tools, you will be able to improve both the quality and speed of any repair.

PLEASE DO NOT WRITE IN LEARNING GUIDE

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THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment Operation Instructor
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to screwdrivers, and hand tools.

YOU WILL: identify screwdrivers, wrenches, and sockets.

HOW WELL: You must successfully complete the Knowledge Test.

Your performance will be assessed by your instructor using the Performance Test on pages 23-24.

ENABLING OBJECTIVES:

1. Identify screwdrivers.
2. Identify pliers, wrenches and sockets.
3. Practice identifying screwdrivers, pliers, wrenches, and sockets.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE

1
number

PAGE 4 OF 25

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify screwdrivers.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. View Resource No. 1 identifying all of the common hand tools.	1. Slide presentation: TPST - 1.
2. Read Resource No. 2 identifying screwdrivers.	2. Text: Diesel Mechanics, pages 356-357.
3. Evaluate your knowledge by completing the Self-Check.	3. Self-Check enclosed.
4. Go on to Enabling Objective No. 2.	

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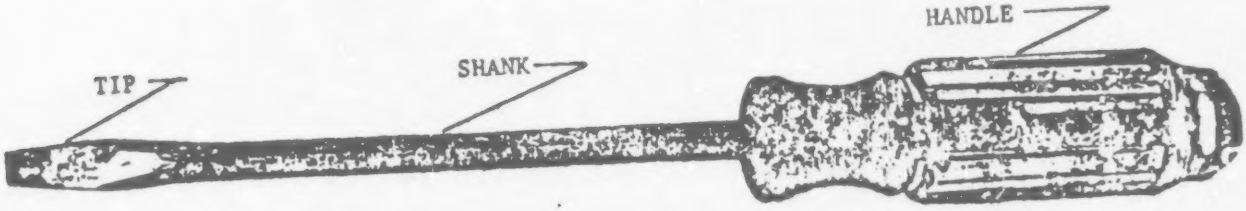
Screwdrivers

This unit will concern itself with the five basic types of screwdrivers used by technicians:

1. Standard
2. Phillips
3. Reed and Prince
4. Clutch
5. Offset

Screwdrivers of various types and sizes are used in industrial occupations. Each type of screwdriver has its own special use. Screwdrivers are used primarily for tightening and loosening screws.

Screwdrivers are not designed to be hit with a hammer or used as a pry bar. On heavy duty screwdrivers with square shanks, it is acceptable to use a wrench on the shank for leverage.



The three basic parts of a screwdriver are the:

1. Handle (wood or plastic)
2. Shank (round or square)
3. Tip (one of the four basic types)

Screwdrivers are classified by the tip design and length of shank.

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This unit will describe five basic types of screwdrivers.

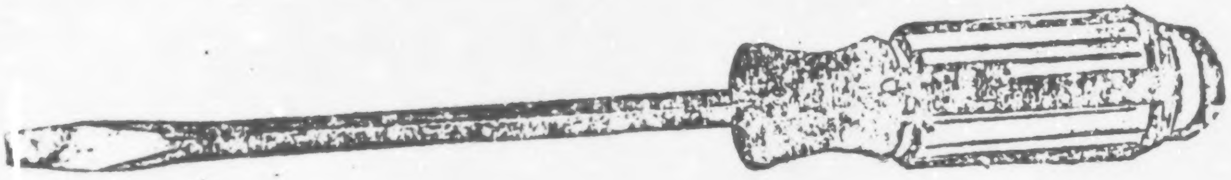

Figure 1: Standard Screwdriver

Figure 1: Standard screwdriver - has a handle and shank; the end of the shank has been flattened to form a blade-tip. The standard screwdriver is used on screws and bolts with slotted heads.

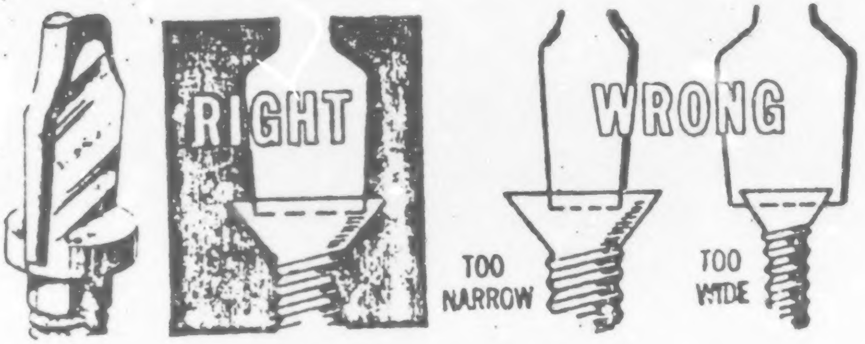

Figure 2: Correct Fit

Figure 2: Correct fit - the screwdriver tip in the screw slot is important. Otherwise, damage will occur to either the screw head or screwdriver tip.

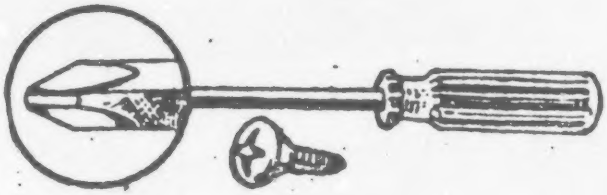

Figure 3: Phillips Screwdriver

Figure 3: Phillips tip screwdriver - shaped like a cross to fit Phillips head screws. There are three sizes: #1, #2, #3. Always select the size that will give the best fit.

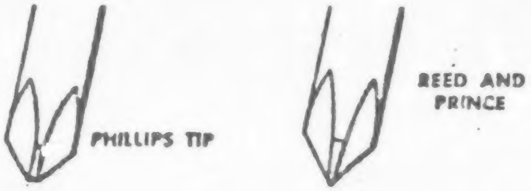

Figure 4: Reed & Prince Screwdriver

Figure 4: Reed & Prince screwdriver - at first glance seem similar to Phillips, but on close examination (see Figure 4) you will see a difference. For one thing, the Reed & Prince is more tapered and goes to a point.

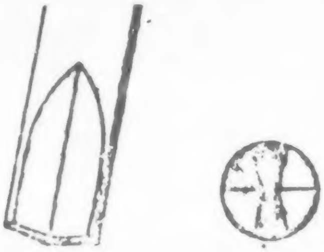

Figure 5: Clutch Tip Screwdriver

Figure 5: Clutch tip screwdriver - shaped like a figure 8 to fit Clutch head screws. They are designed like this to prevent the tip from slipping off the screw head.

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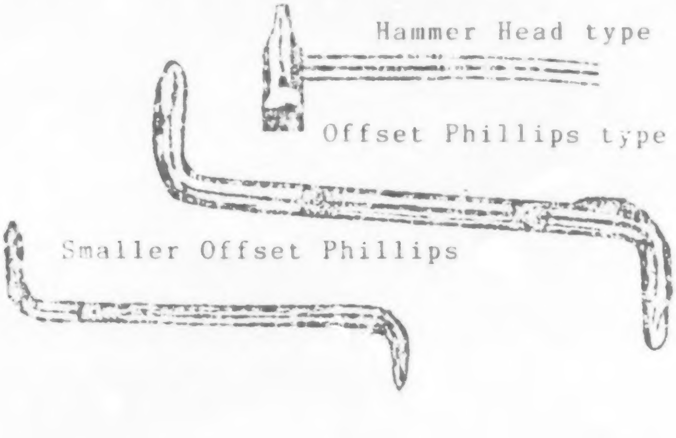
Figure 6: Offset Screwdriver

Figure 6: Offset screwdriver - designed for access to areas where a short shank standard screwdriver cannot be used due to lack of working space. The two tips are made at 90° angles to the metal shank. considerable leverage can be gained with this tool. Any of the four basic tips can be manufactured on offset screwdrivers.

An assortment of offset screwdrivers makes it easy to remove and drive screws in difficult areas. Figure 7.

Offset screwdrivers


Hammer Head type
Offset Phillips type
Smaller Offset Phillips

OTHER TYPES

The long thin shank electrical type screwdriver is handy for working on a small intricate assembly. Another essential screwdriver is the type designed to hold screws while they are being started.

CAUTION!

WHEN HOLDING SMALL EQUIPMENT IN YOUR HAND, DO NOT SHOVE DOWN ON THE SCREWDRIVER HANDLE AS IT MAY SLIP AND PIERCE YOUR HAND! IF WORKING ON ELECTRICAL EQUIPMENT, SHUT OFF THE CURRENT, USE AN INSULATED (FULL LENGTH) SCREWDRIVER AND KEEP YOUR HANDS FREE OF ANY WIRES.

USING SCREWDRIVERS

As with all tools, use a screwdriver that is designed for the job. Unless the screwdriver is designed for the purpose, do not use as a hammer or pry with it.

If the screwdriver tip becomes worn or damaged, grind it slowly so as not to overheat the metal. Attempt to retain the original shape. On the standard tip, do not grind a sharp taper, as this will cause the screwdriver to ride up out of the slot.

SELF-CKECK FOR ENABLING OBJECTIVE 1 number PAGE 10 OF 25

DUTY | TASK | EN OBJ | DEPT. | PROG.

DIRECTIONS:

Evaluate your work by answering the items below on a separate sheet of paper.

1. The standard tip screwdriver can have a ______________ or ______________ shank.
2. ______________ screwdrivers make it easy to remove and drive screws in difficult areas.
3. A screwdriver tip which becomes worn or damaged can be ______________.
4. When grinding a screwdriver tip, do not ______________ the tip.
5. The hammer head type is an ______________ type screwdriver.

Now check your answers with the Answer Key.

SELF-CHECK FOR ENABLING OBJECTIVE 1 number
ANSWER KEY

PAGE 11 OF 25

DUTY | TASK | EN. OBJ. | DEPT. | PROG.

1. round, square
2. offset
3. ground
4. overheat
5. offset

All of your answers should agree with the answers on the Answer Key. IF you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2

number

PAGE 12 OF 25

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify pliers, wrenches and sockets.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying pliers, wrenches and sockets.	1. Instruction Sheet enclosed, Pliers, Wrenches and Sockets
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. When you think you can attain this task, take the Knowledge Test.	3. Knowledge Test for task

Pliers, Wrenches and Sockets

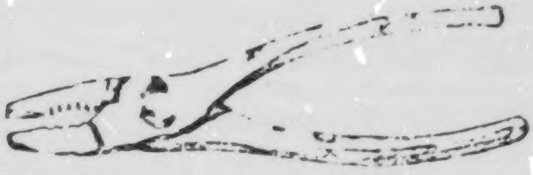


Figure 1: Combination Pliers

Figure 1: Combination pliers - the pliers most commonly used in industrial occupations are the six-inch combination pliers which have a slip joint (or fulcrum) to allow the jaws to open wide enough to grip large diameters. Some combination pliers have a side cutter arrangement for cutting wire, cotter pins, etc. The better grades of combination pliers are made of drop-forged steel and can take a lot of hard usage.

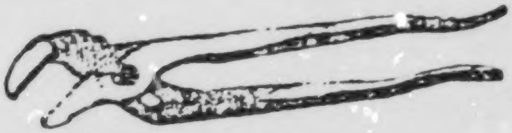


Figure 2: Slip-Joint Pliers

Figure 2: Slip-joint pliers - the Slip-joint design has four (often more) spacer slots to permit quick, nonslip adjustments with practically parallel jaws. These pliers are slim enough, with long enough handles, so that the 45° jaws will reach and firmly grip objects that would be out of reach of ordinary pliers. The jaw teeth are milled sharp and deep to take a firm grip on rods, pipes, hoses, etc. The interlocking design of the slip-joint positively prevents slipping under any load. Incidentally, slip-joint pliers are called "water pump" pliers because it was the only tool with which a technician could remove the gland nut from the water pump in some of the older cars.

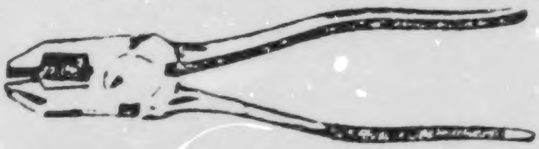


Figure 3: Side-Cutting Pliers

Figure 3: Side-cutting pliers - used for gripping and cutting electrical wire. Also known as electrician's pliers.

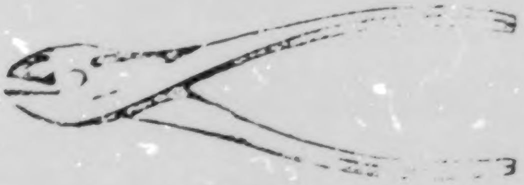


Figure 4: Diagonal Cutting Pliers

Figure 4: Diagonal cutting pliers - usually known as "dikes" - short for diagonals. They are made for the specific purpose of cutting wires. The diagonal cutting pliers have hard cutting edges for the purpose of cutting wires.

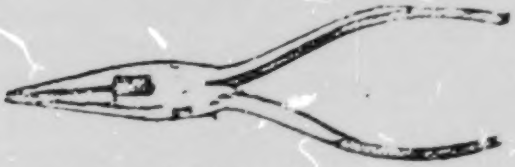


Figure 5: Needle-Nose Pliers

Figure 5: Needle-nose pliers - have long, slender, tapering jaws which are useful for getting into out-of-the-way places and holding small parts. These pliers belong to the "long-nose" pliers family. As the jaws get longer and thinner, they become "needle-nose" pliers. It is most important, in selecting needle- and long-nose pliers, that the tip of the jaws be perfectly aligned. As the jaws become longer and slimmer, more care must be used in handling them.

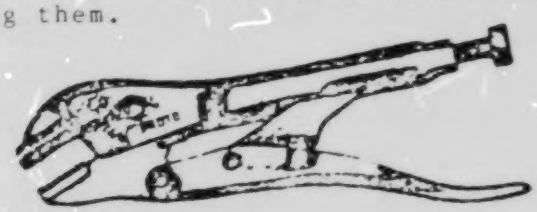


Figure 6: Vise Grips

Figure 6: Vise grips - special type pliers used to hold pieces of metal when soldering, welding, etc. These are compound-lever pliers that remain locked to the work with hands removed. The adjustable lower jaw is retracted by an overcenter spring when the locking handle is released. Adjustment of the jaw opening size is made by turning a screw at the end of the primary handle.

Wrenches are divided into seven basic groups, as follows:

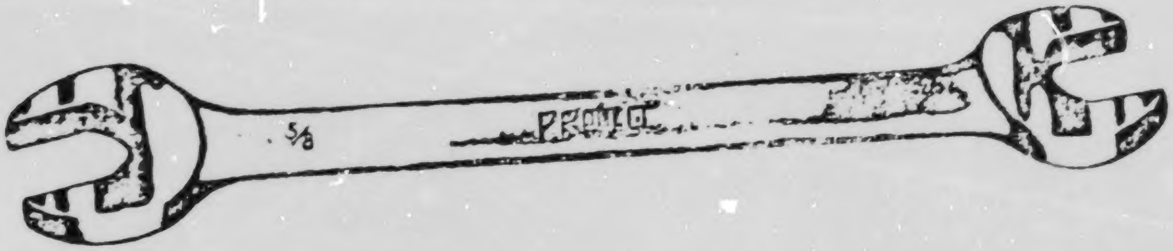


Figure 1: Open-end wrench

Figure 1: Open-end and engineer's wrenches - made with an opening in one or both ends and available with openings from ¼ to 2 inches. The head and openings are set at an angle (usually 15 or 22-1/2 degrees) to the body, so that the nut can be tightened in small areas.

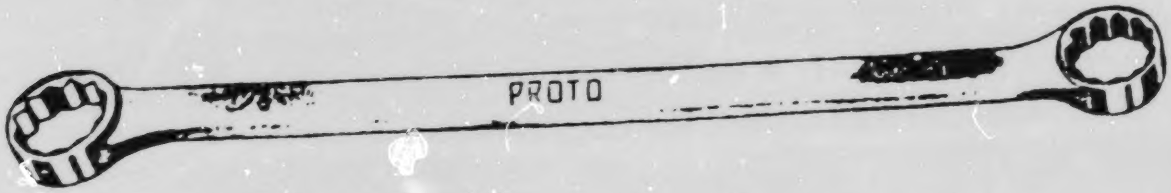


Figure 2: Box wrench

Figure 2: Box wrenches - made with 6 or 12 notches to grip the nut. Some box wrenches are made with a straight end or with the end offset at an angle of 15 or 45 degrees to the handle. Box wrenches usually come in sizes from 1/4 to 2 inches.

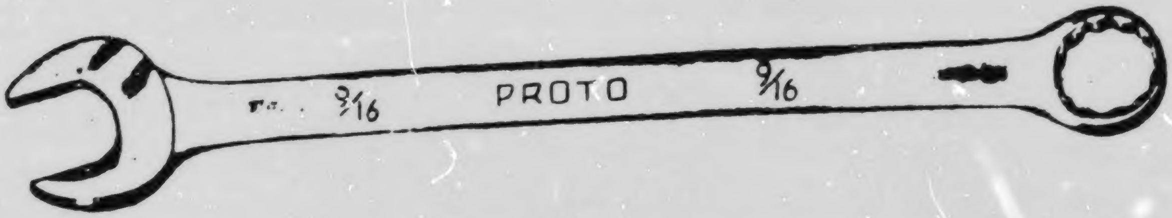


Figure 3: Combination wrench

Figure 3: Combination open-end and box wrenches. These have a box wrench on one end and an open-end wrench on the other. The box wrench is more convenient than the open-end wrench for the final tightening or breaking loose of a nut or a bolt but is less convenient for otherwise turning the nut or the bolt.

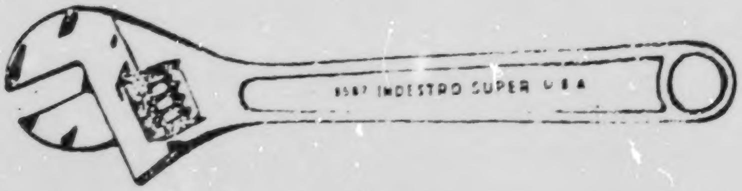


Figure 4: Adjustable wrench

Figure 4: Adjustable wrench - this tool is one of the most popular tools used in the shop. One jaw is fixed and the other can be opened or closed. It comes in various lengths.

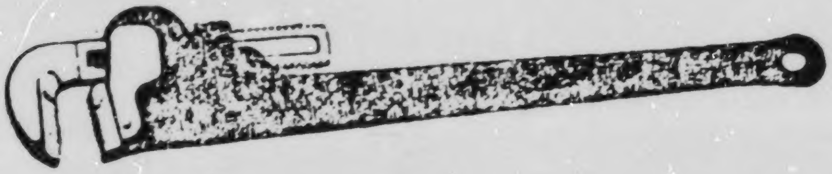


Figure 5: Pipe wrench

Figure 5: Pipe wrench - this is designed for tightening pipe and rod parts. The sharp teeth grip the pipe or rod to assemble it.

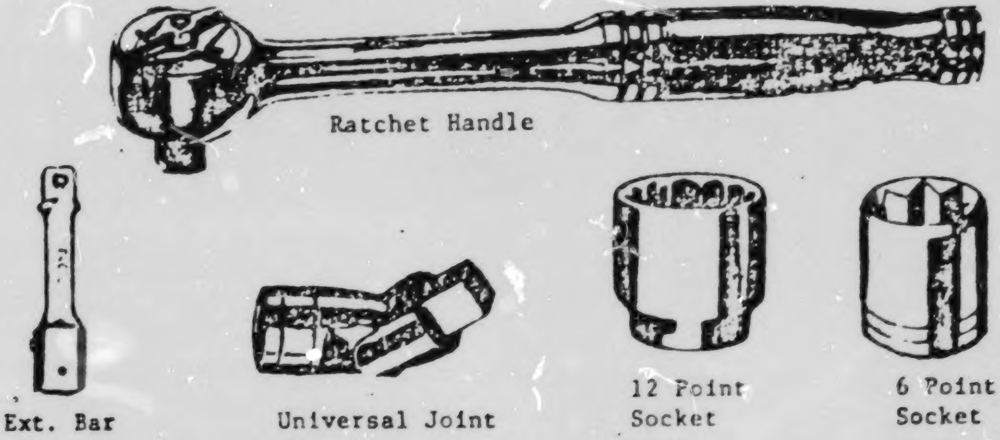


Figure 6: Socket wrench

Figure 6: Socket wrench - these wrenches are somewhat similar to box wrenches, except that the sockets are detachable and are used with special handles. The sockets fit into the handles, the proper type of handle being selected for the particular job. A set consists of socket sizes ranging from 5/16 to 2 inches, extension bars, ratchet handle, and universal joint connector. Sockets have 6 or 12 points.

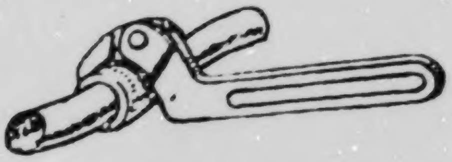


Figure 7: Spanner wrench

Figure 7: Spanner wrench - used to adjust or tighten nuts that have holes or notches around the outside of the nuts. The spanner wrench is used to remove or replace waterproof electrical cable couplings. The spanner wrench will not damage these couplings and should always be used for this purpose.

Sockets

The most common type handles of a socket set are:

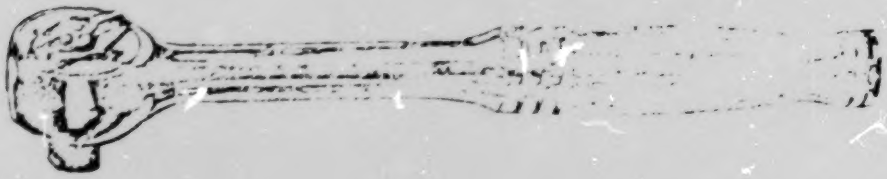


Figure 1: Ratchet handle - designed to be used with socket wrenches, with or without the use of extension drivers. When the ratchet catch is snapped in one direction, pulling the handle will result in a tightening action, and pushing the handle will simply return it to its starting position without the necessity for removing the socket from the nut or bolt. When the ratchet catch is snapped in the opposite direction, the result will be reversed. Pushing the ratchet handle will loosen the nut or bolt and pulling it will bring it back to its starting position. Ratchet handles are great time savers.

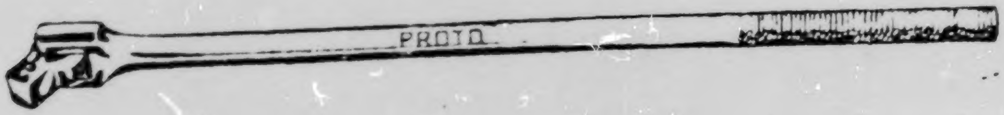


Figure 2: Breaker bar handle - designed with a hinged head to permit working at an angle when tightening or loosening nuts or bolts. The breaker bar can withstand a greater torque than a ratchet handle.

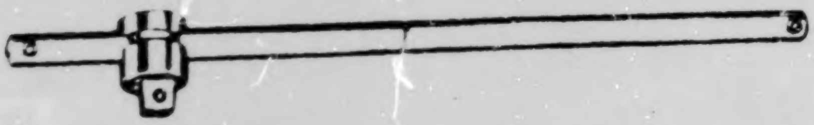


Figure 3: Sliding the handle - designed to permit the head to slide to any position. The head can be positioned at the end or at the center of the handle.

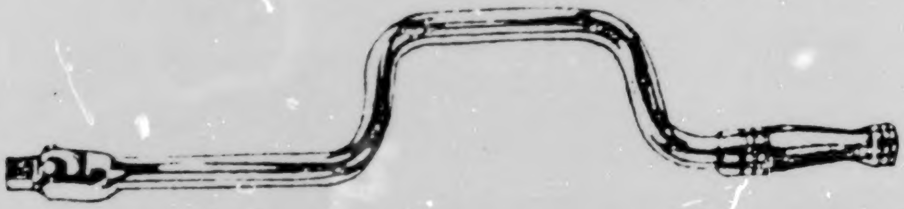


Figure 4: Speed handle - designed for removing nuts or cap screws that have been loosened with a ratchet or breaker bar. This handle permits very little torque to be applied, but great speed.

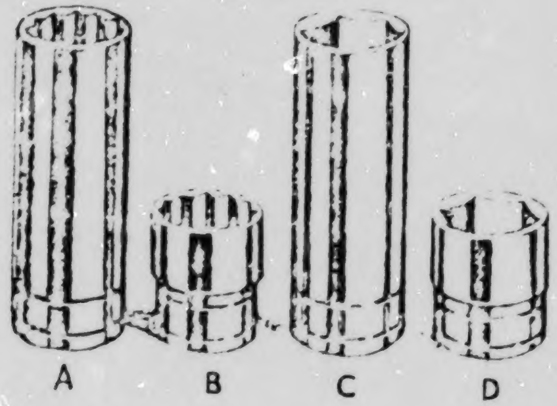


Figure 5: Types of sockets - A. 12 point deep well socket
B. 12 point standard depth socket
C. 6 point deep well socket
D. 6 point standard depth socket

Socket Wrenches

The socket is one of the fastest and most convenient of all the wrenches. Sockets are available in 6 point and 12 point openings and in 1/4, 3/8, 1/2, and 3/4 inch and larger drives. The drive size is indicated by the size of the square female hole or the male drive of the handle.

The mechanic should have a 1/4 inch drive for small fasteners, a 3/8 inch drive to handle the medium sizes and 1/2 and 3/4 inch drive for the remainder of the work. Sockets come in two depths, standard and deep. Standard sockets will handle the bulk of the work. The extra reach of the deep well socket is occasionally needed to reach nuts on long threaded bolts. Sockets come in thin wall and thick wall construction. Thick wall sockets (impact sockets) are used when high torque must be applied to nuts or cap screws.

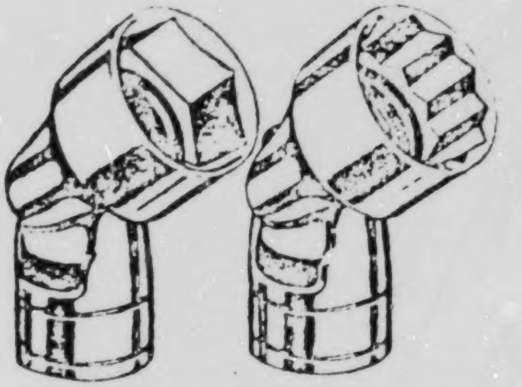


Figure 6: 6 and 12 point swivel sockets - allows the user to tun fasteners at an angle and as a result is used for many jobs. These sockets come in 1/4, 3/8, and 1/2 inch drive, thin and thick wall, standard and deep well.

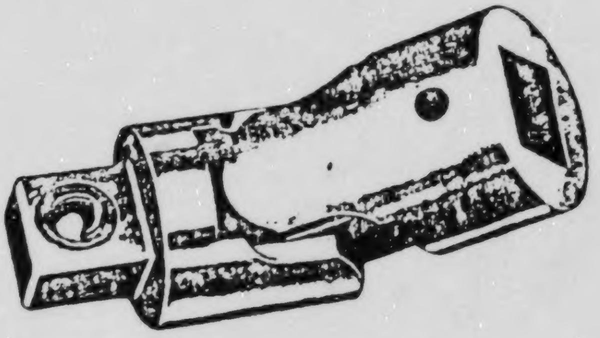


Figure 7: Universal joint - will permit driving at different angles with various sockets and handles. These universal joints come in 1/4, 3/8, 1/2 and 3/4 inch drive, standard and heavy duty construction (for impact tools).

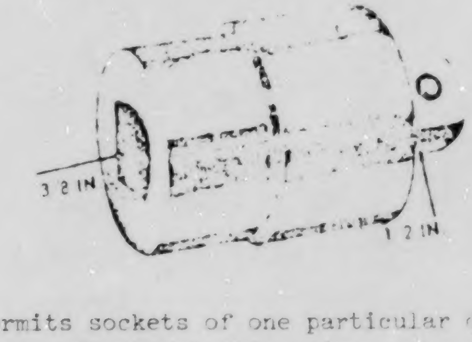


Figure 8: Socket adapters - permits sockets of one particular drive size to be turned with handles of a different drive size.

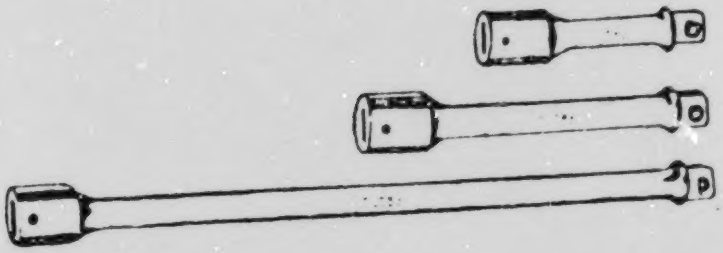


Figure 9: Extensions - permit handle clearance when nuts or cap screws are in cramped spaces. These extensions come in lengths ranging from 2 inches to 36 inches long. Extensions are available in 1/4, 3/8, 1/2 and 3/4 inch drives.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 3 number

PAGE 22 OF 25

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

Enabling objective

Practice identifying screwdrivers, pliers, wrenches, and sockets.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1, practice identifying screwdrivers, pliers, wrenches, and sockets.	1. Identification Kit: Screwdrivers, Pliers, Wrenches, and Sockets
2. When you think you can perform this task, take the Performance Test.	2. Performance Test for task

PERFORMANCE TEST FOR ☐ ☐☐

duty task number

PAGE 23 OF 25

DIRECTIONS:

Given access to common hand tools, you will selcet those indicated by your instructor. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was the standard screwdriver identified?		
2. Was the offset screwdriver identified?		
3. Was the phillips screwdriver identified?		
4. Was the Reed & Prince screwdriver identified?		
5. Was the clutch tip screwdriver identified?		
6. Were combination pliers identified?		
7. Were slip joint pliers identified?		
8. Were side cutting pliers identified?		
9. Were diagonal cutting pliers identified?		
10. Were needle nose pliers identified?		
11. Were vise grip pliers identified?		
12. Was open-end wrench identified?		
13. Was box wrench identified?		
14. Was combination wrench identified?		
15. Was adjustable wrench identified?		
16. Was pipe wrench identified?		
17. Was socket wrench identified?		
18. Was spanner wrench identified?		

DUTY
TASK
ATTEMPT
STUDENT
DATE
☐ Attained
☐ Not attained
EVALUATOR
DEPT.
PROG.

PERFORMANCE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 24 OF 25

PERFORMANCE STANDARDS

ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
19. Was ratchet handle identified?..		
20. Was breaker bar handle identified?..		
21. Was sliding tee handle identified?..		
22. Was speed handle identified?..		
23. Were 6 and 12 point swivel sockets identified?..		
24. Was universal joint identified?..		
25. Was socket adapter identified?..		
26. Were extensions identified?..		

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DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained

☐ Not attained

EVALUATOR

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977

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KNOWLEDGE TEST FOR ☐ ☐☐
duty task number

PAGE 1 OF 8

TASK: Identify Screwdrivers and Hand Tools

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

DUTY
TASK
DEPT.
PROG.

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example if you believe the correct answer relates to box c, fill in box c as follows: ☐ ☐ ■ ☐
To change your answer, erase completely and re-mark.

1. The four basic types of screwdriver tips are:

   a. standard, williams, reed & price, differential.
   b. standard, phillips, reed & prince, clutch.
   c. common, crown, weed & queen, clutch.
   d. standard, dzus, williams & price, clutch

2. The three basic parts of a screwdriver are:

   a. handle, shank, tip.
   b. grip, shaft, bit.
   c. handle, blade, shaft.
   d. grip, shank, end.

. A screwdriver with its tip at a 90° angle to the shank is known as a:

   a. bent.
   b. offset.
   c. close-in.
   d. outset.

. The screwdriver tip which is shaped like a figure 8 is known as a:

   a. common.
   b. dzus.
   c. clutch tip.
   d. weed & price.

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5. The screwdriver tip which resembles a cross with a blunt end is known as a:

   a. common.
   b. phillips.
   c. reed & price.
   d. reed & prince.

6. The screwdriver tip which resembles a cross with a pointed end is known as a:

   a. common.
   b. standard.
   c. reed & prince.
   d. phillips.

7. A screwdriver commonly known as a "6 inch" screwdriver:

   a. has a 6" shank.
   b. is 6" from end to end.
   c. has a #6 tip.
   d. has a 6" handle.

8. The part of the screwdriver which fits into the screw slot is known as the:

   a. handle.
   b. shank.
   c. tip.
   d. end.

9. The type of screwdriver that allows the use of a wrench for leverage will have a:

   a. square handle.
   b. square shank.
   c. hexagon handle.
   d. hexagon shank.

10. When a pry bar is needed, you must use a:

   a. screwdriver.
   b. pry bar.
   c. hammer handle.
   d. long screwdriver.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE 3 OF 8

DUTY
TASK
DEPT.
PROG.

1. Pliers are primarily used to hold and grip:

   a. spark plugs.
   b. small articles.
   c. nuts and bolts.
   d. rivets.

2. Pliers must not be used as a substitute for a:

   a. screwdriver.
   b. hammer.
   c. wrench.
   d. pry bar.

3. Never use pliers for tightening or loosening:

   a. screws.
   b. nails.
   c. rivets.
   d. nuts and bolts.

4. The type of pliers most commonly used is the:

   a. needle-nose pliers.
   b. combination pliers.
   c. vise grips.
   d. slip-joint pliers.

5. The slip-joint pliers are often called:

   a. water pump pliers.
   b. adjustable pliers.
   c. spanner pliers.
   d. side-slip pliers.

6. Side cutting pliers are used for gripping and cutting:

   a. steel rods.
   b. electrical wires.
   c. sheet metal.
   d. rivets.

[illegible] Diagonal cutting pliers are made for the specific purpose of:

   a. cutting sheet metal.
   b. holding screws.
   c. cutting wires.
   d. holding nails.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 4 OF 8

DUTY
TASK
DEPT.
PROG.

18. The type of pliers which have long, slender, tapering jaws is the:

    a. vise grips.
    b. diagonal cutting pliers.
    c. combination pliers.
    d. needle-nose pliers.

19. Needle-nose pliers are used for holding small parts and getting into:

    a. large open places.
    b. convenient places.
    c. out-of-the-way places.
    d. easy-to-reach places.

20. Vise grips are used to hold pieces of metal when:

    a. welding metal.
    b. shearing metal.
    c. sawing metal.
    d. bending metal.

21. Wrenches are primarily used for:

    a. tightening or loosening nuts and bolts.
    b. producing nuts and bolts.
    c. tightening metal rivets.
    d. tightening screws and bolts.

22. When using a wrench, always:

    a. pinch on it.
    b. push on it.
    c. pull on it.
    d. pound on it.

23. A wrench with an opening in one or both ends is a/an:

    a. box end wrench.
    b. open-end wrench.
    c. combination wrench.
    d. adjustalbe wrench.

24. A wrench with a box on one end and an open wrench at the other end is a/an:

    a. open-end wrench.
    b. box end wrench.
    c. double end wrench.
    d. combination wrench.

25. A wrench with 6 or 12 notched closed ends is a/an:

a. box wrench.
b. open-end wrench.
c. closed wrench.
d. combination wrench.

26. A wrench with one jaw fixed and one jaw which can be opened or closed is a/an:

a. combination wrench.
b. pipe wrench.
c. adjustable wrench.
d. open-end wrench.

27. A wrench with sharp teeth and designed to grip rods is a:

a. pipe wrench.
b. combination wrench.
c. box end wrench.
d. closed wrench.

28. A wrench used to remove or replace waterproof electrical cable couplings is a:

a. box end wrench.
b. spanner wrench.
c. combination wrench.
d. closed wrench.

29. The ratchet handle is used with a:

a. box end wrench.
b. combination wrench.
c. closed wrench.
d. socket.

30. Sockets usually have:

a. 2 or 3 points.
[illegible]. 5 or 7 points.
c. 6 or 12 points.
d. 3 or 5 points.

31. The three basic components of a socket wrench set are:

a. bars, ratchets, sockets.
b. handles,sockets, extensions.
c. sockets, extensions, bars.
d. handles, ratchets, sockets.

KNOWLEDGE TEST FOR ☐ duty ☐☐ task number

CONTINUED PAGE 6 OF 8

DUTY

TASK

DEPT.

PROG.

32. The best handle to use when high torque is required is the:

    a. speed handle.
    b. breaker bar handle.
    c. ratchet handle.
    d. angle handle.

33. Extensions are classified by:

    a. width.
    b. length.
    c. weight.
    d. color.

34. The size of the square female hole in the base of a socket, is known as the:

    a. opening.
    b. extension.
    c. adapter.
    d. drive.

35. When using a 1/2 inch drive socket with a 3/8 inch drive handle, you must use a/an:

    a. adapter.
    b. extension.
    c. connector.
    d. handle.

36. When turning fasteners at an angle, you must use a:

    a. standard socket.
    b. deep well socket.
    c. 12 point socket.
    d. universal joint.

37. The most common sockets are available in:

    a. 6 and 12 point type.
    b. 8 and 14 point type.
    c. 6 and 10 point type.
    d. 12 and 8 point type.

38. The best socket used to remove nuts from long threaded bolts, is known as the:

    a. standard socket.
    b. 12 point socket.
    c. 8 point socket.
    d. deep well socket.

DUTY
TASK
DEPT.
PROG.

39. The handle with a head that slides from one end to the other, is known as a:

    a. sliding tee handle.
    b. sliding ratchet handle.
    c. breaker bar handle.
    d. slide speed handle.

40. A heavy duty thick wall socket is also known as a:

    a. high torque socket.
    b. impact socket.
    c. strong type socket.
    d. breaker bar socket.

41. A screwdriver can be sharpened with a:

    a. chisel.
    b. file.
    c. yoke.
    d. sharp object.

42. Greater force can be exerted with a box end wrench than by using:

    a. open end wrench.
    b. socket.
    c. deep well socket.
    d. all of the above.

43. A standard tubing wrench contacts _________ of the six corners of the filling.

    a. 1
    b. 2
    c. 3
    d. 4
    e. 5

The items below are True-False. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example, if you believe the correct answer is True, fill in box a, if you believe the correct answer is False, fill in box b as follows:
Example: ▭ ▬
To change your answer, erase completely and remark.

44. Phillips screwdrivers are usually used around smooth surfaces that are easily marred or scratched if the screwdriver slipped off the screwhead.

DUTY
TASK
DEPT.
PROG.

45. The disadvantage of a Phillips screwdriver is that it takes more torque to install a screw than it does for the same size screw of a slotted style.

46. An adjustable wrench should usually be pushed on rather than pulled on.

47. A torque wrench should be pulled on and jerked quickly to establish the torque on a bolt or capscrew.

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STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 1 0 Identify Saws and Files

DRAFT

PURPOSE:

As you progress in the mechanic's trade, you will be constantly adding to your tool collection. You will need to know how to use each tool for specific jobs. Improper use of any tool can damage the tool itself and can also cause injury to you or the engine you are working on. By using the proper tool or tools, you will be able to improve both the quality and speed of any repair.

DUTY
TASK
PREREQ
DEPT.
PROG.
REVISED

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THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment and Operation Instructor
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES PAGE 3 OF 22

DUTY
TASK
DEPT.
PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance
and standard)

GIVEN: access to tools and equipment,

YOU WILL: identify saws and files.

HOW WELL: You must successfully complete the Knowledge Test.

Your performance will be assessed by your instructor using the Performance Test on page 21.

ENABLING OBJECTIVES:

1. Identify different types of hacksaws and hole saws.
2. Identify different types of files.
3. Practice identifying saws and files.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1

number

PAGE 4 OF 22

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify different types of hacksaws and hole saws.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 to identify the characteristics of hand tools.	1. Text: Diesel Mechanics Workbook, pages 356-357.
2. Read Resource No. 2 identifying saws.	2. Instruction Sheet enclosed, Hacksaws and Hole Saws
3. Evaluate your knowledge by completing the Self-Check.	3. Self-Check enclosed.
4. Go on to Enabling Objective No. 2.	

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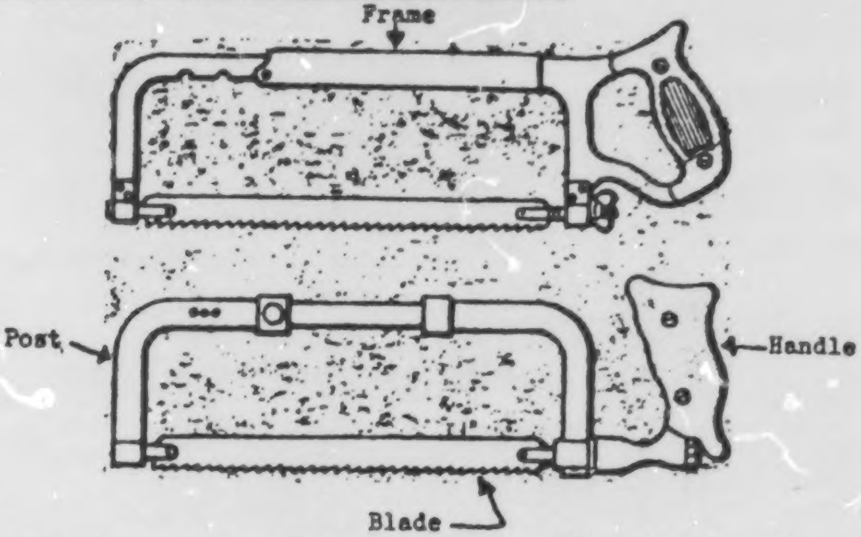
Hacksaws and Hole Saws

Hacksaws and hole saws of many different sizes are used in various industrial occupations. Hacksaws are used primarily for cutting metal, such as round pipe, strap steel, plate steel and bar stock. Hole saws are primarily for drilling holes in sheet metal. Their sizes generally range from 5/8 of an inch to 4 inches.



The hand hacksaw has a U-shaped frame with handle and replaceable blades . The frame itself can be solid, to take one size blade, or adjustable for different length blades. The part that holds the blade, is called the post and can be set at four different positions. For ordinary cutting, the blade is placed in line with the frame. Frames are made with a pistol-grip handle and still newer frames have the handle in an inverted position. The general idea with the inverted handle is that the force applied on the forward stroke of the saw is delivered in a direct line with the blade. Also, on some frames, the blade can be set at any angle in the frame.

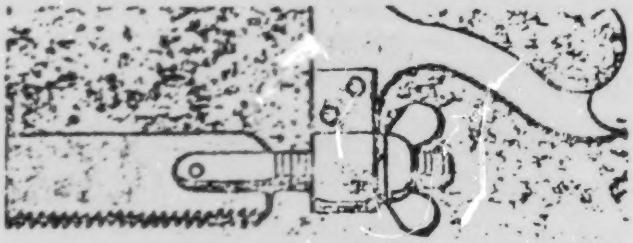


Figure 1: Correct Blade Position

igure 1: Correct Blade Position - Requires that the blade teeth be pointing toward the front of the frame--away from the handle. The reason for this is the cutting action of the blade takes place only on the forward stroke. Pressure must be applied on the forward stroke to force the teeth into the metal being cut. On the backward stroke, you must take the pressure off the blade otherwise the teeth will dull quickly.

HACKSAW BLADE CONSTRUCTION

1. Size - blades are made in 8, 10 and 12 inch lengths, 1/2 inch wide and 0.025 inch thick.

2. Kinds of materials: carbon steel, tungsten alloy steel and molybdenum high speed steel. The cost of hacksaw blades will depend on the quality of material used to manufacture the blade. The high quality hacksaw blade will last longer.

3. Types of blades: all hard, semiflex, and flexible backs. The flexible back has a hard edge that makes it a good all round blade for general use.

4. Number of cutting teeth (per inch):

   14 teeth for cutting soft steel, brass, and cast iron
   18 teeth for cutting drill rod, mild steel, and light angle iron
   24 teeth for cutting brass tubing and metal conduit
   32 teeth for thin tubing, thin sheet metal, and channels

5. Tooth set means the way the teeth are bent to one side or the other, and the amount of bend. The set makes the kerf (cut made by the saw blade) wider than the blade itself.

6. Types of set: alternate set have teeth bent one to the left, then one to the right, etc. The blades come in 14 and 18 teeth per inch.

   Wave set blades have several teeth bent left, then several teeth bent right, etc. They come in 24 and 32 teeth per inch.

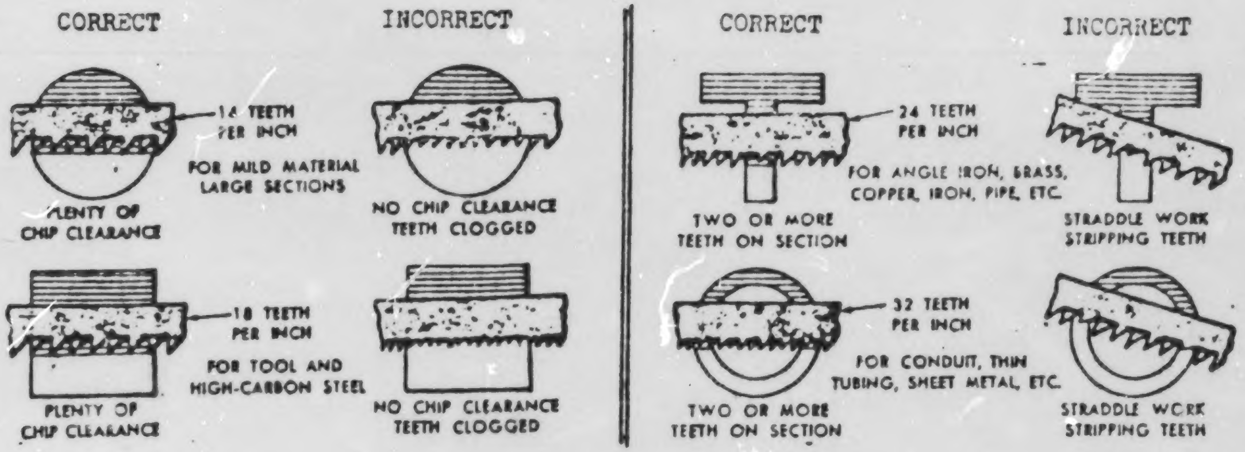

CORRECT
INCORRECT
CORRECT
INCORRECT
14 TEETH PER INCH
FOR MILD MATERIAL LARGE SECTIONS
PLENTY OF CHIP CLEARANCE
NO CHIP CLEARANCE TEETH CLOGGED
24 TEETH PER INCH
FOR ANGLE IRON, BRASS, COPPER, IRON, PIPE, ETC.
TWO OR MORE TEETH ON SECTION
STRADDLE WORK STRIPPING TEETH
18 TEETH PER INCH
FOR TOOL AND HIGH-CARBON STEEL
PLENTY OF CHIP CLEARANCE
NO CHIP CLEARANCE TEETH CLOGGED
32 TEETH PER INCH
FOR CONDUIT, THIN TUBING, SHEET METAL, ETC.
TWO OR MORE TEETH ON SECTION
STRADDLE WORK STRIPPING TEETH

Figure 2: Correct blade selection

igure 2: Correct blade selection--requires that for cutting large sections of mild material, use a blade with 14 teeth to the inch. For tool and high carbon steel, use an 18-inch blade. If you use blades with more teeth than recommended, the saw blade teeth will become clogged because there won't be enough room for chip clearance. For angle iron, brass, copper, iron pipe, etc., use 24 teeth to the inch. And for cutting conduit, thin tubing, and sheet metal, use a blade with 32 teeth to the inch. If there are too few teeth to the inch on the blade being used, the metal being cut will go up between the teeth (will straddle the work) and you'll strip the teeth off the blade.

In starting a cut which is being made to a marked line, it's usually a good idea--especially for the beginner--to use the thumb of the left hand to carefully guide the blade until the cut is started at the desired spot.

Start the cut using either end of the saw blade, but be sure that the blade is cutting metal from the very first stroke. It helps to hold the front of the frame with one hand after the cut is started. Then, after the cut is well started, use the full length of the blade and bear down on the forward stroke to be sure the blade is cutting the metal--not just sliding over it. If you just rub the teeth of the blade against the metal on the forward stroke, you'll only dull the teeth and accomplish nothing--except ruining a blade! On the backstroke, relieve the pressure by lifting the blade slightly from the kerf (the slot made by the saw).

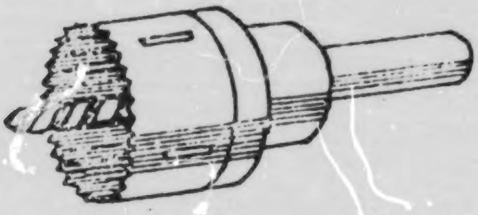


Figure 3: Hole saw and pilot arbor

Figure 3: Hole saw and pilot arbor--are designed to cut round holes in almost any material. They are powered by an electric drill and use 1/4-inch high-speed pilot bits. To properly use a high-speed hole saw, first locate and mark the center of the hole with a center punch. Second, deepen the pilot hole with the 1/4-inch bit and third, install the hole saw bit in the pilot hole and begin cutting.

The cutting speed of a hole saw is determined by:

1. The type of material being cut:
    a. Soft material - high speed
    b. Hard material - slow speed
2. The diameter of the hole saw:
    a. Small diameter (9/16" to 1-1/2") - high speed
    b. Large diameter (1-5/8" to 4") - slow speed
3. Type of lubrication when cutting metal:
    a. Lubrication on saw - high speed
    b. No lubrication on saw - slow speed

A hole saw blade is merely a hacksaw blade made into a circle. The rules that apply to hacksaw blade care also apply to the hole saw. When either the hole saw or hacksaw blade become dull, they are discarded.

SELF-CHECK FOR ENABLING OBJECTIVE 1 number PAGE 9 OF 22

DUTY

TASK

EN. OBJ.

DEPT.

PROG

DIRECTIONS:

Evaluate your knowledge by placing the letter of the correct answer on a separate sheet of paper.

1. Hacksaws are primarily used for sawing:

    a. plastics.
    b. metal.
    c. rubber.
    d. wood.

2. The teeth of the hacksaw blade should be installed with the teeth pointing toward the:

    a. operator.
    b. inside of frame.
    c. front of the frame.
    d. top of the frame.

3. When using the hacksaw, relieve the pressure by lifting the blade slightly on the:

    a. backstroke.
    b. forward stroke.
    c. cross stroke.
    d. upper stroke.

4. The high quality hacksaw blade will:

    a. dull quickly.
    b. be sharper.
    c. cut less metal.
    d. last longer.

5. When using the hacksaw it helps to hold the front of the frame with:

    a. pliers.
    b. vise grips.
    c. wire.
    d. one hand.

6. When a hacksaw blade becomes dull, you should:

   a. sharpen it.
   b. trade it in on a new one.
   c. continue to use it.
   d. discard it.

7. A hole saw is designed to cut:

   a. square holes.
   b. round holes.
   c. triangular holes.
   d. oblong holes.

8. Before drilling with a hole saw, first mark the center of the hole with a:

   a. center punch.
   b. screwdriver.
   c. hammer.
   d. drift punch.

9. A hole saw is usually powered by an electric:

   a. buffer.
   b. grinder.
   c. drill.
   d. wrench.

10. A hole saw is merely a hacksaw made into a:

    a. square.
    b. triangle.
    c. rectangle.
    d. circle.

SELF CHECK FOR ENABLING OBJECTIVE 1 number
ANSWER KEY

PAGE 11 OF 22

DUTY

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PROG.

1. b
2. c
3. a
4. d
5. d
6. d
7. b
8. a
9. c
10. d

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number PAGE 12 OF 22

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

Enabling objective:

Identify different types of files.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 to identify the characteristics of files.	1. a. Text: Diesel Mechanics Workbook, page 356. b. Instruction Sheet enclosed, Files
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. When you think you can attain this task, take the Knowledge Test.	3. Knowledge Test for task

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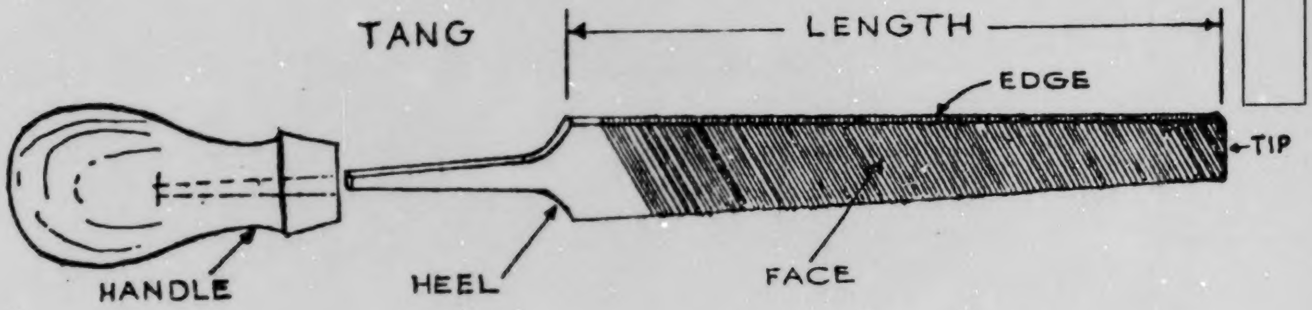
Files

A file is a hardened steel tool, that forms, shapes, and finishes metal by removing small chips.

Files of many types are used in various industrial occupations. Each file has its special use.



The basic parts of a file are:

1. Handle - generally wood to protect operators hand.
2. Tang - pointed end which fits into handle.
3. Face - cutting surface.
4. Length - measurement from TIP to HEEL in inches.

The four most common types of files are:

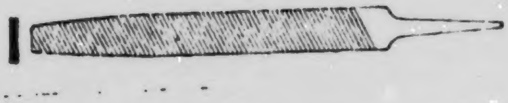


Figure 1: Flat file

Figure 1: Flat file - used for finishing metal surfaces.

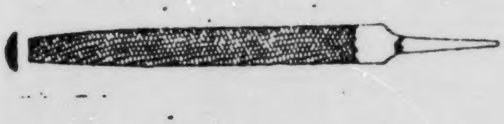


Figure 2: half-round file

Figure 2: Half-round file - used for concave filing.

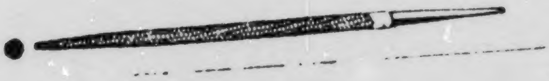


Figure 3: Round file

Figure 3: Round file - used for internal filing of round holes or curved surfaces. This file is also referred to as a "rattail file".

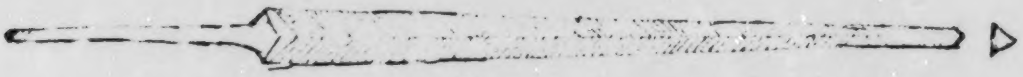


Figure 4: Triangular file

Figure 4: Triangular file - used for finishing out an internal rectangular opening.

USE AND CARE OF FILES

In using a file, always remember that the teeth are made to cut in one direction only - when the file is being pushed forward. Apply pressure to the file as you push it forward and relieve the pressure while you're drawing it back. Your files will actually last longer if you lift the file off the work on the back stroke. Different materials and different files will require varying degrees of pressure. You'll have to learn by experiment and experience. One thing you will discover is that applying too much pressure under certain conditions is just as bad as not applying enough pressure.

Never use a file after the teeth have become clogged with metal chips. If the file gets "loaded" (full of metal particles) use a file card to clean the teeth. A file card is a brush with short, stiff wire bristles. A file that's loaded with metal chips will more than likely roughen a surface which you're trying to file smooth.

Here are a few "DO NOTS": Never use a file as a pry bar. The part that goes into the handle is soft and will bend easily, and the body of the file is hard and very brittle. A light bending force will break it in two. And here's another "DO NOT": Never hammer on a file. This is really dangerous because it may shatter and send pieces flying in all directions.

Files are classified by design characteristics such as; the cross ction shape, cutting surfaces or length.

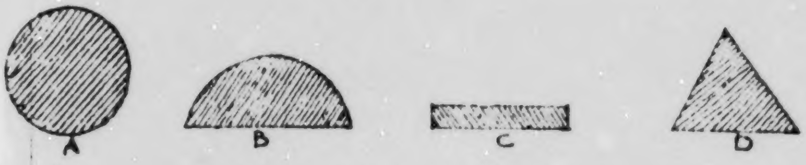


Figure 5: Cross sections

igure 5: Cross sections - shape of the file will determine the type of file. Examples: a) a round file b) half-round file c) flat file d) triangular file. Each file has a cross section that is designed for a special purpose.

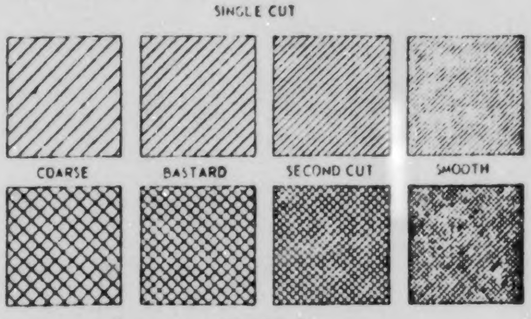


Figure 6: Cutting surfaces

gure 6: Cutting surface files are classified according to the tooth spacing, a coarse file has a small number of large teeth, and a smooth file has a large number of fine teeth. The coarser the teeth, the more metal will be removed by each stroke of the file and, by the same token, the finer the teeth, the smaller the amount of metal removed, and the smoother the filed surface will be.

A file with a single row of parallel teeth is called a single-cut file. Many files have a second row of teeth criss-crossing the first row. These are called double-cut files.

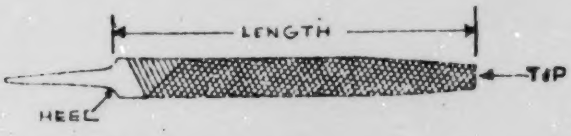


Figure 7: Length of file

gure 7: Length - files are also classified by their length. This is determined by measuring from the heel to the tip. Common sizes are 8", 10" and 12" length.

SELF-CHECK FOR ENABLING OBJECTIVE 2 number PAGE 17 OF 22

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

DIRECTIONS

Evaluate your knowledge by placing the letter of the correct answer on a separate sheet of paper.

1. Files are made of:
   a. brass.
   b. iron.
   c. hardened steel.
   d. aluminum.

2. Files are used to form, shape, and:
   a. bend metal.
   b. shear metal.
   c. roll metal.
   d. finish metal.

3. The cutting surface of a file is known as the:
   a. face.
   b. head.
   c. handle.
   d. tang.

4. The part of the file that fits into the handle is known as the:
   a. face.
   b. tang.
   c. head.
   d. length.

5. The length of a file is determined by measuring from the:
   a. face to the edge.
   b. heel to the tip.
   c. tang to the tip.
   d. handle to the tip.

6. The teeth of a file are designed to cut in:
   a. one direction.
   b. both directions.
   c. any direction.
   d. reverse direction.

7. The term "rattail" file means a:

   a. round file.
   b. flat file.
   c. bastard file.
   d. half-round file.

8. A file with many fine teeth will produce a:

   a. smooth surface.
   b. rough surface.
   c. wavy surface.
   d. choppy surface.

9. The proper tool used to clean the teeth of a file, is known as a:

   a. file card.
   b. wire holder.
   c. file index.
   d. wire wheel.

10. The type of file used to enlarge a hole, is known as a:

   a. round file.
   b. flat file.
   c. triangular file.
   d. square file.

SELF-CHECK FOR ENABLING OBJECTIVE 2 number
ANSWER KEY

PAGE 19 OF 22

DUTY | TASK | EN. OBJ. | DEPT. | PROG.

1. c
2. d.
3. a
4. b
5. b
6. a
7. a
8. a
9. a
10. c

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 3 number

PAGE 20 OF 22

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Practice identifying saws and files.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1, practice identifying the different types of saws and files.	1. Identification Kit: Saws and Files.
2. When you think you can perform this task, take the Performance Test.	2. Performance Test for task
3. When you successfully complete Performance Test, take the Knowledge Test.	3. Knowledge Test for task

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PERFORMANCE TEST FOR ☐ ☐☐

duty task number

PAGE 21 OF 22

DIRECTIONS:

Given access to saws and files, you will select those indicated by your instructor. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was hand hacksaw identified?		
2. Was hole saw identified?		
3. Were hacksaw blades inserted according to outlined procedure?		
4. Was flat file identified?		
5. Was half-round file identified?		
6. Was round file identified?		
7. Was triangular file identified?		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained

☐ Not attained

EVALUATOR

DEPT.

PROG.

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DUTY

TASK

DEPT.

PROG.

Instructional Resources

hultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977.

KNOWLEDGE TEST FOR ☐ ☐☐
duty task number

PAGE 1 OF 2

TASK: Identify Saws and Files

DUTY
TASK
DEPT.
PROG.

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

se a No. 2 pencil to fill in completely the lettered box corresponding
o your answer. For example, if you believe the correct answer relates
) box c, fill in box c as follows:
xample: ▭ ▭ ■ ▭ ▭
change your answer, erase completely and re-mark.

1. Hole saws are used for cutting holes:

a. 6 inches in diameter and above.
b. 6 inches to 10 inches in diameter.
c. 5/8 inch to 4 inches in diameter.
d. under 5/8 inch in diameter.

. The part that holds the blade on a hand hacksaw is called the:

a. handle.
b. frame.
c. post.
d. adjustment.

. The tooth set in a hacksaw blade makes the blade:

a. harder.
b. softer.
c. key wider than the blade itself.
d. easier to install.

. In starting a cut which is being made to a marked line, what should be used as a guide?

a. pair of pliers.
b. the thumb.
c. vise grips.
d. pipe wrench.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number

PAGE 2 OF 2

DUTY

TASK

DEPT.

PROG.

. When using a hole saw:

a. make center of hole with center punch.
b. drill with ¼" drill.
c. install hole saw bit in pilot hole.
d. all of the above.
e. none of the above

The items below are True-False. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example, if you believe the correct answer is True, fill in box a, if you believe the correct answer if False, fill in box b as follows:
Example: ☐ ■
To change your answer, erase completely and re-mark.

. In some hacksaws the blade can be set at an angle.

. Hacksaw blades come in different lengths usually 8, 10, or 12 inches.

. When using a hand hacksaw you can begin a cut with either end of the blade.

. When cutting soft steel, brass or cast iron you should use a blade with 14 teeth per inch.

. When cutting thin sheet metal and thin tubing you should use a blade with 18 teeth per inch.

. A file is made of mild steel.

It is not necessary to use a file handle.

. A flat file is used for finishing concave surfaces.

. A file should never be used as a pry bar.

. If you use a hammer on a file it may shatter.

. The coarser the teeth on a file the smoother the filed surface.

. A file with a single row of parallel teeth is called a double cut file.

. The length of a file is determined by measuring from tip to tip.

. Files are classified by design characteristics such as cross sections shapes.

. When using a file you should not use pressure on forward strokes but use pressure on return strokes.

KNOWLEDGE TEST ANSWER KEY

DUTY

TASK

DEPT

PROG

Multiple Choice questions

c 1.
c 2.
c 3.
b 4.
d 5.

___ 6.
___ 7.
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___ 14.
___ 15.

___ 16.
___ 17.
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___ 20.

___ 21.
___ 22.
___ 23.
___ 24.
___ 25.

True-False questions

[✓ T] F 1.
[✓ T] F 2.
[✓ T] F 3.
[✓ T] F 4.
T [✓ F] 5.

T [✓ F] 6.
T [✓ F] 7.
T [✓ F] 8.
[✓ T] F 9.
[✓ T] F 10.

T [✓ F] 11.
T [✓ F] 12.
T [✓ F] 13.
[✓ T] F 14.
T [✓ F] 15.

T F 16.
T F 17.
T F 18.
T F 19.
T F 20.

T F 21.
T F 22.
T F 23.
T F 24.
T F 25.

Matching questions

___ 1.
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___ 25.

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 1 1 Select Taps and Dies

DRAFT

PURPOSE:

There are a variety of taps and dies and you must be able to select the correct one for each job. A good mechanic knows that the improper use of tools may cause personal injury or damage the tool.

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DUTY
TASK
PREREQ.
DEPT.
PROG.
REVISED

THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment Operation Instructor
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance,
and standard)

GIVEN: access to taps and dies.

YOU WILL: select taps and dies.

HOW WELL: You must successfully complete the Knowledge Test.

Your performance will be assessed by your instructor using the Performance Test on page 14.

ENABLING OBJECTIVES:

1. Identify types of taps.
2. Identify types of dies.
3. Practice selecting taps and dies.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1 number

PAGE 4 OF 15

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective:

Identify types of taps.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the different types of taps.	1. a. Text: Deisel Mechanics Workbook, pages 380-381. b. Instruction Sheet enclosed, Taps
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. Go on to Enabling Objective No. 2.	

Taps

HANDS TAPS - Hand taps are used to cut screw threads up to one inch in diameter in soft metals and plastics.

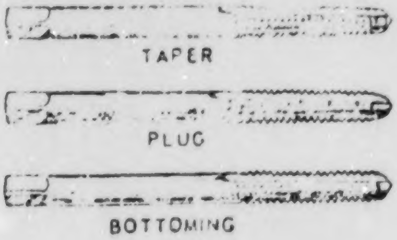

Figure 1: Hand tap

Figure 1: A hand tap looks like a fluted screw and it will cut its own threads in a hole of the correct diameter. Great care is required in using small taps, 1/8 inch or less in diameter, because taps are extremely brittle. Most taps are broken because of excessive side pressure while turning.

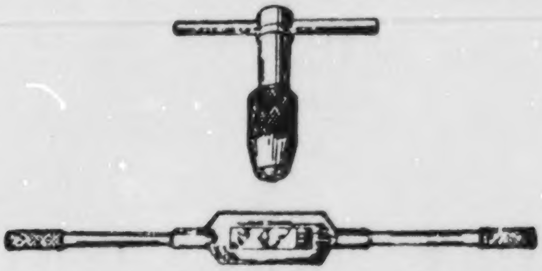

Figure 2: Adjustable Hand-tap Wrenches

Figure 2: The hand tap wrench is used to clamp the square end of the tap, so that the tap is held firm and straight. Suppose you want a tapped (or threaded) hole that will accept a 1/4-20 screw. Begin by selecting the proper drill to be used. Tables that tell you which drill you must use with any given tap are readily available. Then clamp the work in a vise and drill a hole through it with the required drill. Clamp the square end of the tap shank in a tap wrench. Now place the tapered end of the tap on the hole, so that the tap is in line with the hole. You must keep the tap in line with the hole. Start the tapping by turning the wrench about 1/4 counter-clockwise for a left-hand thread. Then back the tap off about 1/8 of a turn. Now turn the tap forward about half a turn and back it off a quarter of a turn. This procedure will provide a firm grip for the tap, and you may continue. However, turn the tap forward a little at a time and back it off after each half turn forward. This will allow the

metal chips that are cut from the metal to be removed from the bottom of the tap, which does the actual cutting. Accurate tapping which produces clean, sharp threads can be really learned only by experience under the guidance of a craftsman.

SELF-CHECK FOR ENABLING OBJECTIVE 1 number PAGE 7 OF 15

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

DIRECTIONS:

Evaluate your knowledge by answering True or False to the items below on a separate sheet of paper.

1. Hand taps are used to cut threads in soft metal.
2. A hand tap will cut its' own threads if the hole is too small.
3. Taps are very brittle and break easy.
4. It is not important to select proper drill size when using a tap.
5. After the tap is started in the metal you should turn the tap in as you would a cap screw into a metal plate.

Now check your answers with the Answer Key.

SELF-CHECK FOR ENABLING OBJECTIVE 1 number
ANSWER KEY

PAGE 8 OF 15

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

1. True
2. False
3. True
4. False
5. False

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All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number PAGE 9 OF 15

Enabling objective

Identify types of dies.

DUTY | TASK | EN. OBJ. | DEPT | PROG.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. I identifying the types of dies.	1. a. Text: Diesel Mechanics Workbook, pages 380-381. b. Instruction Sheet enclosed, Dies and Die Stock
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed.
3. Go on to Enabling Objective No. 3.	

Dies and Die Stock

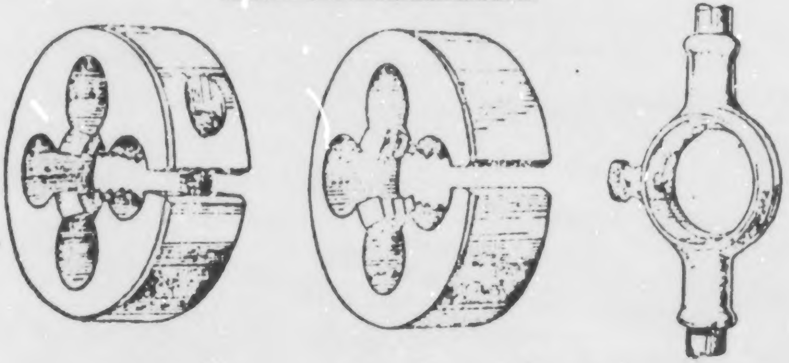

Figure 3: Dies and Die Stock

Figure 3: Dies - Dies are used for cutting external threads. This operation is easier than tapping, but it still requires skill and practice. It is essential that the rod to be threaded be of the correct diameter. If it is a little undersize, the resulting screw will be a sloppy fit in the tapped hole.

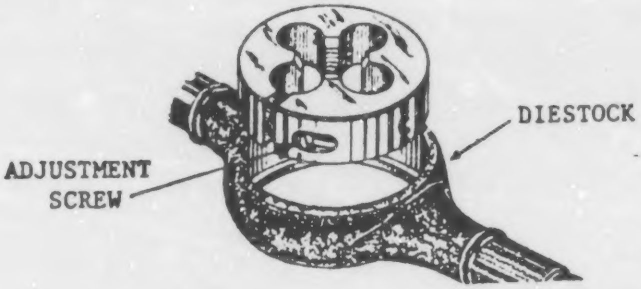

Figure 4: A Diestock With Die

Figure 4: The diestock with die above is ready to be put in place. Some dies are adjustable so that correct, slightly oversized and slightly undersized threads can be cut. This adjustment is done by means of a screw.

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate sheet of paper.

Evaluate your knowledge by answering True or False to the items below on a separate sheet of paper.

1. A die nut can cut inside threads.
2. Die nuts are made only for metric threads.
3. Die nuts never need oiling.
4. Die nuts can be used as locking nuts in an emergency.

Evaluate your knowledge by putting the letter of the correct answer on a separate sheet of paper.

5. A die is a special type of tool that:
   a. is easily damaged.
   b. repairs and makes male threads.
   c. should be used only by an expert.
   d. makes threads stronger than new.

Now check your answers with the Answer Key.

1. False
2. False
3. False
4. False
5. b

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All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 3 number PAGE 13 OF 15

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Practice selecting taps and dies.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1 practice identifying taps and dies.	1. Identification Kit: Taps and Dies
2. When you think you can attain this task, take the Knowledge Test.	2. Knowledge Test for task
3. When you successfully complete the Knowledge Test, take the Performance Test.	3. Performance Test for task

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PERFORMANCE TEST FOR ☐ ☐☐

duty task number

PAGE 14 OF 15

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained
☐ Not attained

EVALUATOR

DEPT.

PROG.

DIRECTIONS:

Given access to taps and dies, you will select those indicated by your instructor. You will be evaluated for attainment of this task, based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was hand tap identified?..		
2. Was die identified?..		
3. Was diestock identified?..		

DUTY

TASK

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977.

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KNOWLEDGE TEST FOR ☐ ☐☐

duty task number

PAGE 1 OF 2

TASK: Select Taps and Dies

DUTY

TASK

DEPT.

PROG.

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate sheet of paper.

DO NOT MARK ON THIS TEST!

he items below are Multiple Choice. Use a No. 2 pencil to fill in ompletely the lettered box corresponding to your answer. For example, if ou believe the correct answer relates to box c, fill in box c as follows:
xample: ☐ ☐ ■ ☐
o change your answer, erase completely and re-mark.

. Hand taps are used to cut:

a. slots.
b. threads.
c. holes.
d. grooves.

. A hand tap is designed to look like a:

a. rivet.
b. fluted screw.
c. chisel.
d. tapered punch.

. Great care is required in using small taps, because they are:

a. soft.
b. threaded.
c. brittle.
d. tapered.

. Taps are primarily used to:

a. rethread a bolt.
b. rethread a hole.
c. make a screw thread.
d. make a hole.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE 2 OF 2

DUTY | TASK | DEPT. | PROG.

5. Most taps are broken because of:

   a. insufficient pressure while turning.
   b. excessive threads in the hole.
   c. insufficient turning of the tap.
   d. excessive side pressure while turning.

6. When turning a tap clockwise into a hole, you are cutting:

   a. threads for a bolt.
   b. threads for a cap screw.
   c. a right-hand thread.
   c. a left-hand thread.

7. External threads are cut with a:

   a. tap.
   b. tap handle.
   c. die.
   d. die stock.

8. It is essential that the rod to be threaded be of the correct:

   a. length.
   b. weight.
   c. angle.
   d. diameter.

9. Over-sized and under-sized threads can be cut by using:

   a. a fixed die.
   b. an adjustable die.
   c. a blank die.
   d. an oblong die.

0. The function of the small screw in a die is to:

   a. hold the die together.
   b. hold the die in stock.
   c. adjust the die angle.
   d. adjust the die cutting thread.

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STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: A COMPLETING CORE CURRICULUM

TASK: 0 3 Practice Shop Safety

DUTY A
TASK 03
PREREQ
DEPT. IN
PROG. 9123
REVISED

DRAFT

PURPOSE:

Safety is everyone's business, whether in the shop, on the road, or in the home. Safety cannot be measured by taking an examination and forgetting about it, but must be measured by proper application of everyday safety practices. There are many types of safety precautions to be observed in the diesel shop, such as careful equipment use and operation, safe housekeeping practices, electrical fire prevention, personal safety precautions, etc. This student learning guide will help you learn about safety in the shop.

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THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

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2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

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THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
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OBJECTIVES

PAGE 3 OF 23

DUTY A
TASK 03
DEPT. IN
PROG. 9123

PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to shop safety rules.

YOU WILL: practice shop safety.

HOW WELL: You must successfully complete the Knowledge Test.

ENABLING OBJECTIVES:

1. Identify shop safety procedures.
2. Identify fire safety procedures.
3. Identify first aid procedures.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1 number

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DUTY A
TASK 03
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Enabling objective:

Identify shop safety procedures.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Use Resource No. 1 to identify the safety procedures for your shop.	1. a. Audio visual: Safety Presentation No. 1 b. Instruction Sheet enlcosed, General Safety Rules c. Instruction Sheet enclosed, Safety Rules You Can Live By d. Instruction Sheet enclosed Good Housekeeping Practices e. Instruction Sheet enclosed, Unsafe Electrical Practices
2. Read Resource No. 2 to identify the procedures for safely operating equipment.	2. Instruction Sheet enclosed, Safe Use of Instructional Materials and Equipment
3. Read Resource No. 3 identifying the procedures for lifting heavy items.	3. Instruction Sheet enclosed, Lifting
4. Evaluate your knowledge by completing the Self-Check.	4. Self-Check enclosed.
5. Go on to Enabling Objective No. 2.	

General Safety Rules

1. Eye protection MUST be worn at all times when using hand tools, machine tools, chemicals or hot metals equipment. (Florida State Law)

2. All guards must be in place when using any piece of equipment. (Florida State Law)

3. All power equipment shall be shut off before making any adjustments or change in the operating arrangements of the machine.

4. All material will be properly and securely clamped down during cutting, forming or joining operations. (the hand will not be accepted as a proper clamp)

5. Jewelry (watches, rings, neck chains, etc) and dangerous clothing (neckties, suit jackets, long sleeve shirts, etc.) will be removed.

6. ALL accidents must be reported immediately to your supervisor in order for proper action to be taken.

7. Proper care will be taken to assure the maintenance of tools and machines in safe work area conditions. Tools and machines should be checked for safe working conditions before using and when found to be damaged or unsafe should be reported immediately to the instructor.

8. If you are in doubt, DON'T!!! See your instructor.

INSTRUCTION SHEET FOR ENABLING OBJECTIVE 1 number

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DUTY A
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Safety is an attitude of the mind. It is something that must be practiced whenever YOU are working. The safe way may be the longest but remember: ACCIDENTS NEVER TAKE A VACATION!

Read the General Safety Rules. Before YOU may work in the lab, YOU MUST demonstrate your understanding of these rules by writing them or verbally explaining each rule.

"SAFETY IS THE ATTITUDE OF THE MIND!"

Instruction Sheet prepared by Mr. Harrison, Mr. Poling, and Mr. Rosenberger.

Safety Rules You Can Live By

1. Safety goggles must be worn when using grinders, buffers, or other machinery requiring them.
2. Clean up oil and grease spots from floor immediately.
3. Place all oily and dirty shop towels in a closed container provided for that specific purpose.
4. Never smoke in shops.
5. Close parts-cleaning tank, gas cans, lacquer cans, oil cans, etc. after use.
6. HORSE PLAY in the shop is PROHIBITED AT ALL TIMES.
7. Report all accidents or injuries to the instructor immediately, regardless of their nature or severity. Accident forms must be completed for all accidents or injuries.
8. Use extreme caution in moving or using machines or vehicles in the shop. An automobile which has no brakes or a fast moving floor jack are heavy items which could strike someone.
9. Always use the correct tools on any job or operation.
10. Extreme care will be taken with any electrical equipment or work regardless of the nature.
11. Keep hands and clothing away from moving parts.
12. DO NOT wear rings and watches while working.
13. DO NOT crawl under a car that is jacked up unless there are safety stands under it.
14. Test brakes before moving any car.
15. Keep your entire body under the car when making repairs. Don't extend your legs or arms beyond the body of the car.
16. DON'T leave creepers on the floor where someone can step on or trip over them.
17. DO NOT block access to fire hoses and extinguishers. Report promptly any damaged or missing fire-fighting equipment.

Instruction Sheet prepared by Mr. Harrison, Mr. Poling, and Mr. Rosenberger.

Good Housekeeping Practices

Good housekeeping practices cannot be attained by an occasional grand clean-up. The program for keeping the area clean must be one of continuous activity, and procedures must be established for checking and evaluating its effectiveness. The following are examples of good housekeeping practices:

1. The general appearance of the area is clean, orderly, and well painted. Adequate lighting and ventilation facilities are present.
2. The machinery and equipment are arranged to permit safe and efficient work practices with ease in cleaning.
3. Materials and supplies are safely stacked or stored in the proper places.
4. Tools and accessories are safely stored in cabinets, on racks, or in other suitable devices.
5. Sufficient waste containers and receptacles are provided in appropriate locations and emptied frequently.
6. The working areas and work benches are clear and free of debris and other hazards.
7. Floors are clean and free from all obstructions, foreign material, or slippery substances such as water, oil, and grease. Floor surfaces are slip-resistant.
8. Aisles, traffic areas, and exits are free of materials and other debris. They are properly marked and defined.
9. All corners are clean, well lighted, and free from waste materials.
10. Combustible materials are properly disposed of or stored in approved containers.
11. Clean rags and waste are stored in metal containers, while oily rags are stored in self closing or spring lid metal containers.
12. All flammable liquids are stored in safety cans, and the safety cans are stored in fireproof rooms or cabinets.

Instruction Sheet prepared by Mr. Harrison, Mr. Poling, and Mr. Rosenberger.

Unsafe Electrical Practices

DIRECTIONS: Study the list below; then investigate throughout the shop to try to locate unsafe conditions which might exist. Make a list and give it to your instructor if any of the conditions exist.

Unsafe practices and work procedures result in electrical accidents and fires. Some of the common unsafe acts committed in the shop are:

1. Using ungrounded equipment and portable tools or removing ground connections.
2. Using defective tools or equipment in need of repair.
3. Using equipment which does not meet the approval of the Underwriters Laboratories or other similar agencies.
4. Unsafe cleaning of electrical panels, switch boxes, motors, and other electrical equipment with water or dangerous solvents.
5. Overloading of circuits or overfusing circuits by the use of wrong size or type of fuse.
6. Failure to use suitable safety equipment, gloves, rubber mats, etc. for electrical installation and repair.
7. Failure to de-energize circuits before working on equipment.
8. Improper opening and closing of switches and improper use of electrical equipment.
9. Permitting rubbish, trash, rags, etc., to accumulate near electrical equipment.
10. Work practices which damage motors, insulation, wires, or electrical accessories.
11. Disconnecting of electric cords by pulling on the cords rather than on the plug; stringing extension cords around the shop.

NOTE: Although the above list of unsafe practices is far from complete, you should be aware of the common electrical hazards and unsafe practices and be able to identify and eliminate them.

INSTRUCTION SHEET FOR ENABLING OBJECTIVE 1 number PAGE 10 OF 23

DUTY A
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Safe Use of Instructional Equipment and Materials

School administrators, supervisors, and teachers have clear-cut responsibilities for the success of accident prevention. Likewise, students have responsibilities to teachers, fellow students, and to themselves which are demonstrated through the safe use of instructional equipment and instructional materials. There are many such responsibilities or practices. Among these student practices are the following (it must be noted, of course, that safe practices for students are also safe practices for teachers):

1. Keep all hand tools clean, and in safe working order.
2. Report any defective tools, machines, or other equipment to the teacher.
3. Retain all guards and safety devices except with the specific authorization of the teacher.
4. Operate a hazardous machine only after all other students are clear of the machine.
5. Confine long hair before operating rotating equipment.
6. Operate a hazardous machine only after receiving instruction on how to operate the machine safely.
7. Wear appropriate eye protection wherever there is any danger from flying or falling particles or chips, radiation, glare, or hazardous substances in the work or environment.
8. Wear approved respirator protection where harmful dusts or fumes exist.
9. Wear shop clothing appropriate to the instructional activity being performed.
10. Remove ties when working around machine tools or rotating equipment.
11. Remove rings and other jewelry when working in the shop.
12. Participate in NO horseplay, practical jokes, or running in the shop or laboratory area.
13. Report all accidents to the teacher regardless of nature or severity.
14. Turn off power before leaving a machine tool.

15. Make sure that all guards and barriers are in place and adjusted properly before starting a machine tool.

16. Recognize the distinctive sound of a properly adjusted and smooth running machine tool.

17. Develop a respect for machine tools and understand their purpose.

18. Use soap and water frequently as a method of preventing skin diseases from hazardous substances.

19. Operate an internal combustion engine only if the exhaust is connected properly to an approved ventilation system.

20. Disconnect the power from machine tools before performing any maintenance tasks.

21. Use a solvent only after determining its properties, what kind of work it does, and how to use it.

22. Put tools, repair parts, or other objects in their proper place when not in use.

23. Protect the cord of a portable electric hand tool from oil, hot or rough surfaces, and chemicals.

24. Clean the chips from a machine with a brush. NOT with a rag or the bare hands.

25. Wear suitable gloves or hand pads when handling sharp, heavy, rough, or hot materials and chemicals.

26. Use metal containers with lids for oily waste or oily rags.

27. Operate a machine tool only after being sure that your footing is good.

28. Keep the shop or laboratory floor clear of scraps or litter and wipe up immediately any liquids spilled on the floor.

29. When operating a machine tool, give undivided attention to the task being performed.

30. Avoid using wrenches which do not properly fit the nuts, bolts, or other objects which they are being used to turn.

Instruction Sheet prepared by Mr. Rosenberger, Mr. Harrison, and Mr. Poling.

INSTRUCTION SHEET FOR ENABLING OBJECTIVE 1 number PAGE 12 OF 23

DUTY A | TASK 03 | EN. OBJ. 1 | DEPT. IN | PROG. 9123

Lifting

"It's not what you lift but how you lift it." This statement applies to the lifting, lowering, or moving of heavy equipment or loads. The following procedure is prescribed by the National Safety Council for lifting loads, the reverse procedure is followed for lowering the load.

1. Make a preliminary "heft" to be sure that the load is easily within your lifting capacity. If it is not, secure help.
2. Set your feet solidly and apart, one foot slightly ahead of the other. In some cases, it might be easier to go down almost to the floor on one knee while keeping the other leg at a 90° angle at the knee.
3. Crouch as close to the load as possible with legs bent at about a 90° angle at the knee.
4. Keep the back as straight as possible; it should NOT be arched.
5. Get a firm grip on the object, lifting one end slightly if necessary to get one hand under it. Grip the load so that it will NOT slip while you are lifting and carrying it and so that your hands will be protected.
6. To lift the object, straighten your legs, keeping your back erect and your head up.

Instruction Sheet prepared by Mr. Rosenberger, Mr. Harrison, and Mr. Poling.

SELF-CKECK FOR ENABLING OBJECTIVE 1 number PAGE 13 OF 23

DUTY A
TASK 03
EN. OBJ. 1
DEPT. IN
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DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate sheet of paper.

1. Where is the emergency eye wash basin located?
2. In case of an accident who should you notify?
3. How much air pressure is built up by the air compressor?
4. Where are the oxyacetylene torches to be stored?

Now check your answers with the Answer Key.

SELF-CHECK FOR ENABLING OBJECTIVE 1 ANSWER KEY

number

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DUTY A | TASK 03 | EN. OBJ. 1 | DEPT. IN | PROG. 9123

1. Southwest corner of shop just below the white cross.
2. Instructor.
3. 160 psi.
4. The welding bay.

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2 number PAGE 15 OF 23

DUTY A | TASK 03 | EN. OBJ. 2 | DEPT. IN | PROG. 9123

Enabling objective

Identify fire safety procedures.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the causes of fires.	1. Instruction Sheet enclosed, Causes of Fires
2. Read Resource No. 2 identifying the types of fire extinguishers.	2. Instruction Sheet enclosed, Fire Extinguishers and Uses
3. Read Resource No. 3 to identify how you should exit the building during a fire drill.	3. a. Instruction Sheet enclosed, Worker Control During Fires b. Instruction Sheet enclosed, Fire Drill Evacuation Route
4. Evaluate your knowledge by completing the Self-Check.	4. Self-Check enclosed.
5. Go on to Enabling Objective No. 3.	

Causes of Fires

Because the nature of school work requires the use of fire, heat, and flammable or combustible materials, there are numerous sources from which a flame may originate. The auto shop, where several different processes and materials are in use, is probably more vulnerable to fire hazards than some other shops you may have worked in. Attention should be called to the following factors when planning for fire prevention:

GAS

Gas is used extensively in school shops as the fuel for brazing, heat treating, soldering, and melting furnaces. Gas equipment may leak or gas may escape because of faulty ignition in the appliance. Frequent inspection and the use of safety pilots and cut-off valves is essential where gas is in use. Special instruction must be given to students before they are permitted to light gas fired torches or appliances.

HOUSEKEEPING

Housekeeping is closely associated with fire protection. Flammable and combustible materials need to be stored in the proper place and manner. Rubbish must not be allowed to acccumulate on floors, in corners, or in other areas. Waste material should be removed daily. Oil accumulation on floors, oil soaked rags or porous floors may ignite if contacted by flame, sparks or sufficient heat.

ELECTRICAL EQUIPMENT

Electrical devices and equipment which are improperly installed, worn, old, or poorly maintained may cause a fire. A short circuit arc may produce sufficient heat to ignite flammable materials.

MATCHES AND SMOKING

Common causes of fire in industrial plants which should be controlled in the school situation are matches and smoking. Smoking should be no problem in most school shops, since students are usually not allowed this privilege. Matches present a different problem because they are used and carried by students. Only safety matches should be allowed in the shop, and, whenever torches are to be lit, the safety, flint, or scratch-type lighter should always be used.

SPONTANEOUS IGNITION

This form of ignition perhaps has been more common in school shops than in industry, partially due to lack of understanding by students and to the fact that combustibles are often left in one location for considerable lengths of time, such as over weekends or holidays. Oily or paint soaked rags and clothing left in student lockers are probably the greatest hazard. Other sources contributing to this hazard are rubbish and accumulation of dust, lint, and oil in duct work and flues. Safety metal containers with a self closing lid must be used for the storage of oily or paint filled waste and rags.

Fire Extinguishers and Uses

FOR CLASS 'A' FIRES: You probably should not have this type of extinguisher in the auto shop because it generally contains only water. Water on gasoline or oil fires would cause it to spread. Water on electrical fires (not automotive) could result in the user being electrocuted. You may notice this type of extinguisher in the hallway and stamped on it should be visible CLASS 'A' FIRES followed by directions telling what type of fires it may be used for. These fire extinguishers are generally used for paper or wood materials.

FOR CLASS 'B' FIRES: These extinguishers are filled with CO_2 and are used for electrical fires without danger of electrocution. They may also be used for oil and gasoline fires if no other type of extinguisher is available. The CO_2 comes out with force and could blow gasoline away causing the fire to spread. CO_2 eliminates oxygen over the fire, causing the fire to die out. A gauge on the extinguisher handle will indicate when the extinguisher is full and ready for use. The weight indicates the content of the extinguisher.

FOR CLASS 'C' FIRES: These extinguishers can be used on nearly all fires...electrical, flammable liquids, chemicals, etc. These extinguishers contain powders under pressure and smother the fire by eliminating the oxygen needed to sustain it. This extinguisher also contains a gauge which indicates the pressure within the extinguisher and whether it is ready for use. Whether the extinguisher is full or not is determined by its weight, which you probably will be unable to judge.

'B' - 'C' type fire extinguishers contain powders under pressure and are used on Class 'B' or 'C' fires. They are generally placed in shops where danger exists for the inexperienced to grasp the wrong extinguisher in an attempt to put out a fire.

'A' - 'B' - 'C' type extinguishers are available for use on nearly every conceivable type of fire. They contain powders under pressure and help eliminate having to fill several types of extinguishers with different materials. In other words, they eliminate maintenance inventory.

On all types of extinguishers available, the Type 'A'-'B'-'C' should probably be placed in the auto shop. If its use were required, it would eliminate the possibility of an excited and inexperienced worker grabbing the wrong extinguisher.

Instruction Sheet prepared by Mr. Harrison, Mr. Poling, and Mr. Rosenberger.

Worker Control During Fires

Memorize the evacuation procedures listed below.

1. Most schools have an alarm system for signaling students and teachers that the building should be evacuated because of fire, gas, smoke, or impending disaster. Most states require by law that schools hold fire drills at regular intervals. Make certain that you know the fire drill regulations and the procedures to follow.

2. When the alarm is sounded for a fire drill and before you evacuate the building:

    a. Stop all activity and listen for instructions.

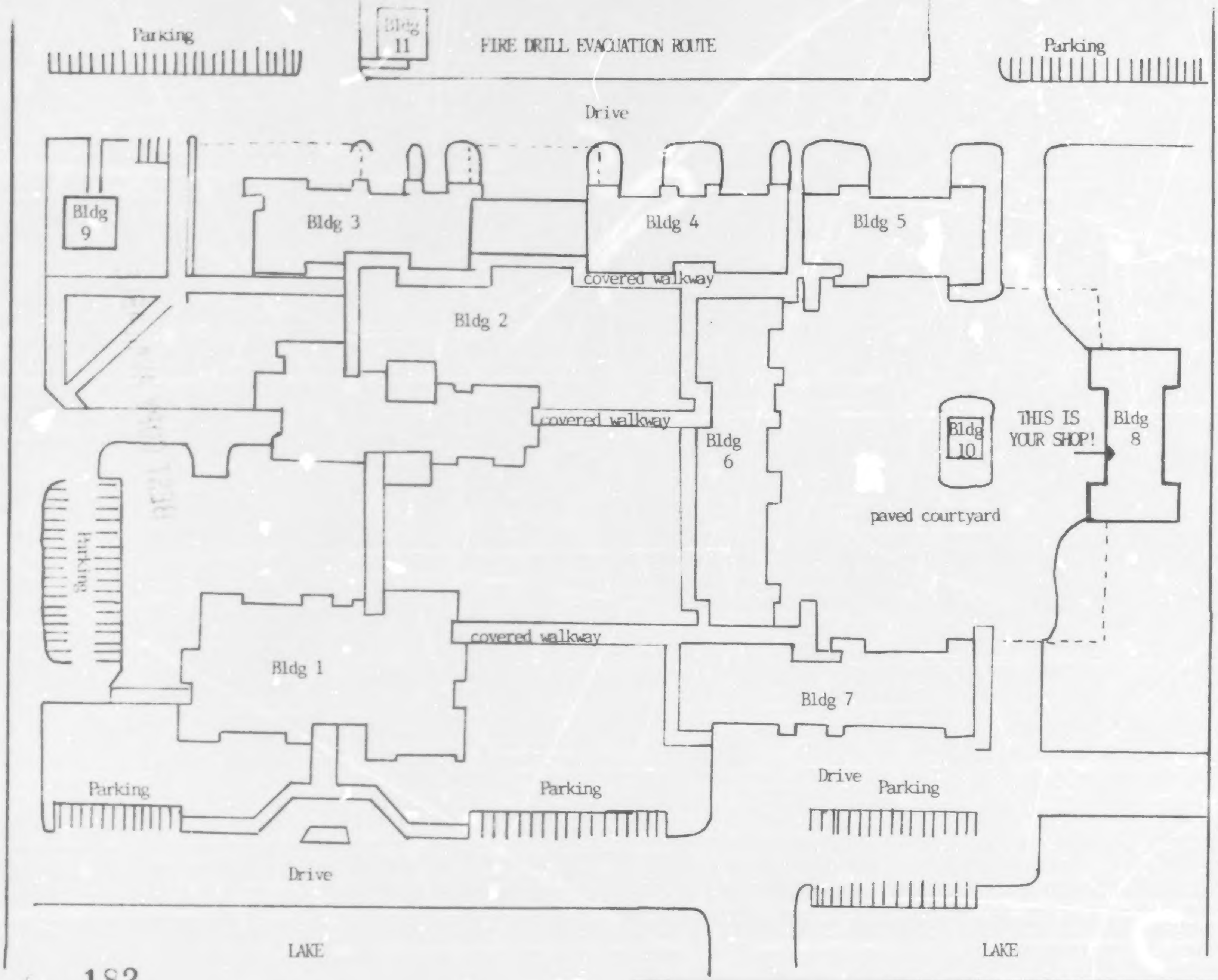
    b. Each piece of operating equipment should be turned off and all power disconnected at the main switch.

    c. Gas valves, torches, and portable heating equipment should be turned off.

    d. Leave the area immediately according to the fire drill plan.

INSTRUCTION SHEET FOR ENABLING OBJECTIVE

number 2


Parking
Bldg 11
FIRE DRILL EVACUATION ROUTE
Parking
Drive
Bldg 9
Bldg 3
Bldg 4
Bldg 5
covered walkway
Bldg 2
covered walkway
THIS IS YOUR SHOP!
Bldg 10
Bldg 8
Bldg 6
Parking
paved courtyard
covered walkway
Bldg 1
Bldg 7
Parking
Parking
Drive
Parking
Drive
LAKE
LAKE

DUTY A	TASK 2	EN. OBJ. 2	DEPT. IN	PROG. 9123

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 3 number

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DUTY A
TASK 03
EN. OBJ. 3
DEPT.IN
PROG. 9123

Enabling objective

Identify first aid procedures.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the procedures for emergency first aid to the eyes.	1. Instruction Sheet enclosed, First Aid for Eye Emergencies
2. Evaluate your knowledge by completing the Self-Check.	2. Self-Check enclosed
3. When you think you can attain this task, take the Knowledge Test.	3. Knowledge Test for task A-03.

First Aid for Eye Emergencies

SPECKS IN THE EYE.....

DO lift upper eyelid outward and down over the lower lid.

DO let tears wash out speck or particle.

DO - if it doesn't wash out - keep eye closed, bandage lightly and see a doctor.

DO NOT rub the eye.

BLOWS TO THE EYE.....

DO apply cold compresses immediately, for 15 minutes; again each hour as needed to reduce pain and swelling.

DO - in case of discoloration or "black eye," which could mean internal damage to the eye - see a doctor.

CUTS AND PUNCTURES OF EYE OR EYELID.....

DO bandage lightly and see a doctor at once.

DO NOT wash eye out with water.

DO NOT try to remove an object stuck in the eye.

CHEMICAL BURNS

Eye damage from chemical burns may be extremely serious, as from alkalis or caustic acids; or less severe, as from chemical "irritants."

In all cases of eye contact with chemicals:

DO flood the eye with water immediately, continuously, and gently, for at least 15 minutes. Hold head under faucet or pour water into the eye using any clean container. Keep eye open as widely as possible during flooding.

DO NOT use an eye cup.

DO NOT bandage the eye.

SPRAY CANS are an increasing source of chemical eye injury, compounded by the force of contact. Whether containing caustics or "irritants," they must be carefully used and kept away from children.

Reprinted with permission from the National Society for the Prevention of Blindness.

Instructional Resources

Glenn Rosenberger, Joe Harrison, Roy Poling, "Audiovisual Safety Presentation No. 1", West Technical Education Center, Belle Glade, Florida, 1982.

KNOWLEDGE TEST FOR ☐ ☐☐

duty task number

PAGE________ OF________

DUTY

TASK

DEPT.

PROG.

TASK: Practice Safety

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example if you believe the correct answer related to box c, fill in box c as follows: [a] [b] ■ [d]
To change your answer, erase completely and re-mark.

1. In case of an accident you should:
   a. call the hospital.
   b. call a doctor.
   c. call the instructor.
   d. none of the above.

2. When cutting, joining, or forming material, use:
   a. your hands to secure material.
   b. some kind of clamp to hold the material.
   c. your friends to hold the material.
   d. all of the above.

3. Jewelry (rings, watches, pendants):
   a. should not be removed before working.
   b. make work more interesting.
   c. should be removed before working.
   d. all of the above.

4. When working with power machines you should:
   a. shut off power before making an adjustment.
   b. make sure guards are in place.
   c. make sure eye protection is used.
   d. all of the above.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE ________ OF ________

DUTY | TASK | DEPT. | PROG.

5. While working a machine you should:

   a. talk to your friends.
   b. talk to your instructor.
   c. shut the machine off and get help.
   d. none of the above.

6. When using a machine you should:

   a. take the guard off, it's useless.
   b. use the guard only when necessary.
   c. make sure it does not interfere with your work.
   d. none of the above.

7. When handling chemicals you should:

   a. make sure the room is ventilated and wear eye protection.
   b. make sure the container is sealed.
   c. all of the above
   d. none of the above

8. It is important to:

   a. maintain tools and working area.
   b. maintain the working area.
   c. maintain friendships with classmates.
   d. all of the above.

9. Hands should never be:

   a. put on moving parts of a machine
   b. put in pockets.
   c. used as a measuring device.
   d. none of the above.

10. Damaged tools:

   a. can be used until new tools replace them.
   b. should be reported to your instructor.
   c. should be sold at half price to students.
   d. none of the above.

The items below are True-False. Use a No. 2 pencil to fill in completely the lettered box. Mark box a if the item is True or mark box b if the item is False. To change your answer, erase completely and re-mark.

1. Always try to keep your hands clean.

2. Wear eye protection when eye hazards exist.

KNOWLEDGE TEST FOR ☐ ☐☐

CONTINUED duty task number PAGE ________ OF ________

DUTY | TASK | DEPT. | PROG.

13. It is acceptable to have more than one person operate a machine.

14. Only clean the machines when they start to rust.

15. If you have long hair, you should tie it back or use a hair net.

16. Report all injuries to your instructor, however slight.

17. If there are no safety lines around a machine, it is alright to work more than one student.

18. Report to your instructor any equipment that does not work properly or makes funny noises.

19. Clean up the area you are working in only when you are finished at the end of that period.

20. Before operating a machine always ask permission before your start.

BEST COPY AVAILABLE

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 1 3 Use Twist Drills

PURPOSE:

Twist drills are used in various industrial occupations. Materials are fastened together using the holes made by the twist drill. You, as a diesel mechanic, should be able to operate a twist drill.

PLEASE DO NOT WRITE IN LEARNING GUIDE

DUTY
TASK
PREREQ.
DEPT.
PROG.
REVISED

THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment and Operation
West Technical Education Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES

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DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance,
and standard)

GIVEN: access to a set of twist drills.

YOU WILL: use twist drills.

HOW WELL: You must successfully complete the Knowledge Test

Your Performance will be assessed by your instructor using the Performance Standards on page 10.

ENABLING OBJECTIVES:

1. Identify steps in maintaining the drill.
2. Identify drill sizes.
3. Practice using the twist drill.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐ number

PAGE 4 OF 11

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Identify steps in maintaining the drill.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 identifying the parts of a twist drill and drill sizes.	1. a. Instruction Sheet enclosed, Twist Drills b. Text: Diesel Mechanics, page 355-357.
2. Read Resource No. 2 to identify the procedure for sharpening a drill.	2. Text: Diesel Mechanics Workbook, page 363.
3. Read Resource No. 3 identifying the recommended cutting fluids.	3. Text: Diesel Mechanics Workbook, page 364.
4. As a Self-Check complete Resource No. 4.	4. Text: Diesel Mechanics Workbook, page 364-365, Questions 1-19.
5. Go on to Enabling Objective No. 2.	

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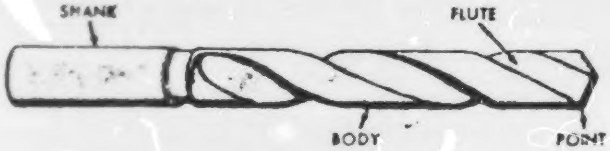
Twist Drills

Twist drills are used in various industrial occupations. Twist drills are used primarily for drilling holes in various types of materials. These holes are used to join parts together by using various types of fasteners.

The main parts of a twist drill are:

1. Shank
2. Body
3. Flute
4. Point



The shank is the portion of a twist drill which is clamped into a drill motor chuck. The shank portion will either have a straight or tapered shank. The straight shank drill is more common to mechanics where the tapered shank is used principally by machinists in lathes or special drill presses.

The flutes act as channels for the escape of metal chips from the hole that is being drilled and permit the lubricant to travel down to the cutting edges at that point.

The cutting points of most drills are ground to equal lengths at an angle of 95 degrees. The trailing lip must have clearance so the leading lip can cut into the metal.

Drills are made of either carbon or high-speed steel. Though the high-speed drills (stamped HS or HSS on or near the shank) are a little more expensive, they are much better than carbon-steel drills. They wear much longer and do not break down as easily.

Twist drills are classified by their diameters in three ways: fractions, numbers, and letters.

Fractions: This method of classifying drills is the most commonly used. On a fraction classified drill, the size of the diameter is marked on the shank with a fraction. A common set of drills (Drill Index) would range in size of diameter from 1/64 inch to 1/2 inch. With each drill increasing in diameter by 1/64 of an inch.

Numbers: This method classifies drills by wire gauge size. These drills range in diameter from a small number 80 to the largest number 1, with these numbers marked on the drill shank. These drills are generally "hand turned" in a holding fixture, because of their small size a drill motor would cause breakage. Number drills are useful for drilling precise jets and other precision parts. The diameter of these drills are spaced very close together. Example: A number 65 drill is only .004 of an inch smaller in diameter than a number 64.

Letters: This method classifies drills using alphabetical letters. These letters indicate the diameter of the drill and is marked on the shank. These drills range in size from the smallest letter A to the largest letter Z. Letter drills begin in size where number drills end.

Note that all three sets are made so that each drill differs by only a few thousandths from the next size. No two drills are exactly the same size, except the 1/4 inch and the E drill, which are both 0.250 inch. The size of the drill is stamped on the shank. If the mark is worn off, you can check the drill size with a drill gauge. There is a drill gauge made for each different set of drills. The drill size can also be checked with a micrometer. The speed used for drilling with twist drills will depend upon the following:

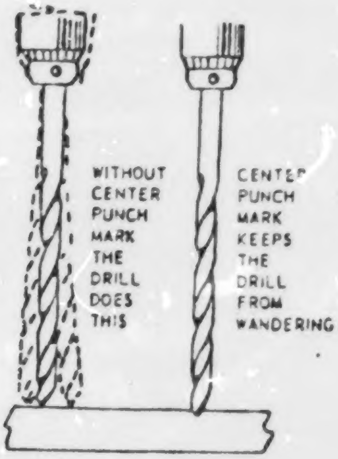
1. The kind of drill, whether it is carbon or high-speed steel.
2. The size of the drill.

3. The material being drilled.
4. The use of a coolant.

Generally, the larger the drill, the slower the speed. The softer the material the higher the speed. Using a coolant or cutting fluid allows higher drill speeds. High speed drills can be operated at about twice the speed of carbon steel drills.

Feed is the distance the drill moves into the stock with each complete turn. Apply just enough pressure to make the drill cut the metal, but not so much that the drill burns or breaks. Do not apply too little pressure, for this will produce a scraping or dulling action.

Cutting fluid is used in drilling as a lubricant (oil) and to keep the drill cool.


WITHOUT CENTER PUNCH MARK THE DRILL DOES THIS
CENTER PUNCH MARK KEEPS THE DRILL FROM WANDERING

The illustration above shows a small indentation to guide the drill is made with a center punch at the exact location for a hole. If this mark proves not to be correctly located, it can be moved by slanting the punch, that is, relocating it in the exact spot, then straightening the punch and enlarging the mark.

The work should be secured in a vise or clamp, the rotating drill placed over the center punch mark and a slight cone-shaped cut made to see if thehole is on center. If it is the drilling can be completed. Ease up on the drilling pressure just before the drill breaks through the work. This will keep the drill from grabbing and jamming.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE ☐

number

PAGE 9 OF 11

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective

Practice using the twist drill

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. When you think you can attain this task, take the Knowledge Test.	1. Knowledge Test for task
2. Using Resource No. 2, practice using the drill. Have your instructor check your work.	2. Drill
3. When you think you can perform this task, take the Performance Test.	3. Performance Test for task

PERFORMANCE TEST FOR ☐ ☐☐
duty task number

PAGE 10 OF 11

DIRECTIONS:

Given access to a twist drill, you will practice using a twist drill. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Were safety glasses worn?		
2. Was work secured in a vise or clamp?		
3. Was drill held according to outlined procedures?		
4. Was small indentation made with center punch to guide the drill?		
5. Was drill speed selected according to the kind of drill, size of drill, material being drilled, and the use of a coolant?		
6. Was pressure applied so that drill burns or breaks were avoided?		
7. Was pressure applied so that scraping and dulling was avoided?		
8. Was drilling pressure eased just before the drill broke through the work to avoid jamming?		

DUTY
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ATTEMPT
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DATE
☐ Attained
☐ Not attained
EVALUATOR
DEPT.
PROG.

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LIST OF **RESOURCES, MATERIALS, AND EQUIPMENT** PAGE 11 OF 11

DUTY

TASK

DEPT.

PROG.

Instructional Resources

Schultz, Erich, Diesel Mechanics, McGraw - Hill Inc, New York, 1977

KNOWLEDGE TEST FOR ☐ ☐☐

duty task number

PAGE 1 OF 2

TASK:

DUTY

TASK

DEPT.

PROG.

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate sheet of paper.

he items below are Multople-Choice. Use a No. 2 pencil to fill in mpletely the lettered box corresponding to your answer. For example f you believe the correct answer relates to box c, fill in box c as ollows: a b c d

o change your answer, erase completely and re-mark.

. The part of the twist drill that is held in an electric drill chuck is the:

a. shank.
b. point.
c. body.
d. end.

. Drills are made of either:

a. carbon or high-speed steel.
b. iron or steel.
c. slow-speed or high-speed steel.
d. brass or iron.

. Twist drills are classified by their:

a. hardness.
b. length.
c. cutting ability.
d. diameter.

. Cutting fluid is used in drilling and lubricant and is used to keep the drill:

a. centered.
b. hot.
c. cool.
d. cutting.

KNOWLEDGE TEST FOR ☐ ☐☐
CONTINUED duty task number PAGE 2 OF 2

DUTY | TASK | DEPT. | PROG.

[illegible]. A center punch mark will keep the drill from:

a. wandering.
b. breaking.
c. dulling.
d. overheating.

[illegible]. The distance the drill moves onto the stock with each complete turn, is known as:

a. feed.
b. wandering.
c. distance per square inch.
d. cutting.

7. Soft materials should be drilled at:

a. slower speeds.
b. higher speeds.
c. variable speed.
d. constant slow speed.

[illegible]. An example of the marking on a Fraction drill would be:

a. 3/16.
b. J.
c. 29.
d. .500.

[illegible]. An example of the marking on a Number drill would be:

a. 3/16.
b. J.
c. 29.
d. .500.

[illegible]. An example of the marking on a Letter drill would be:

a. 3/16.
b. J.
c. 29.
d. .500.

STUDENT LEARNING GUIDE

THE SCHOOL BOARD
OF PALM BEACH COUNTY, FLORIDA

PROGRAM: DIESEL EQUIPMENT DEPARTMENT

DUTY: C COMPLETING CORE CURRICULUM

TASK: 1 2 Select Wire Wheels and Brushes

PURPOSE:

Wire wheels and brushes are designed for specific purposes. You must use tools for purpose they are designed to insure long wear. Mechanics take pride in caring for their tools and equipment.

DUTY
TASK
PREREQ
DEPT.
PROG.
REVISED

PLEASE DO NOT WRITE IN LEARNING GUIDE

THE SCHOOL BOARD OF PALM BEACH COUNTY

DEPARTMENT OF VOCATIONAL-TECHNICAL EDUCATION

North Technical Education Center
7071 Garden Road
Riviera Beach, Florida 33404

South Technical Education Center
1300 S. W. 30th Avenue
Boynton Beach, Florida 33435

West Technical Education Center
2625 State Road 715
Belle Glade, Florida 33430

E. Miles Bacon, Director of Vocational-Technical Education

Wilma McCarty, Curriculum and Staff Development Specialist

THIS STUDENT LEARNING GUIDE WAS DEVELOPED BY:

Mr. Joe Harrison, Heavy Equipment Mechanics Instructor
West Technical Education Center

Mr. Roy Poling, Heavy Equipment and Operation Instructor
West Technical Edcuation Center

Mr. Glenn Rosenberger, Diesel Engine Mechanics Instructor
West Technical Education Center

The format used in this student learning guide is one of the products developed through a grant from the Division of Vocational Education, Florida Department of Education which designated Ridge Vocational-Technical Center as a state demonstration site for competency-based vocational education.

OBJECTIVES

DUTY

TASK

DEPT.

PROG.

PERFORMANCE OBJECTIVE:
(Include condition, performance, and standard)

GIVEN: access to shop tools and equipment,

YOU WILL: select wire wheels and brushes.

HOW WELL: You must successfully complete the Knowledge Test.

ENABLING OBJECTIVES:

1. Identify types of wire wheels and brushes.
2. Practice selecting wire wheels and brushes.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 1 number PAGE 4 OF 13

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

Enabling objective

Identify types of wire wheels and brushes.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Read Resource No. 1 to identify the different types of wire wheels and brushes.	1. Instruction Sheet enclosed, Wire Wheels and Brushes
2. Complete the Self-Check.	2. Self-Check enclosed.
3. Go on to Enabling Objective No. 2.	

Wire Wheels and Brushes

The common types of wire brushes are:

1. Wire wheel
2. Wire rotary brush
3. Wire hand brush

Wire wheels and brushes of many types are used in various industrial occupations. Wire brushes are used primarily for cleaning or removing hardened carbon, paint, rust, or hardened film deposits from a surface. Depending on the type of brush used in a given situation, wire brushes could also be used for metal polishing.

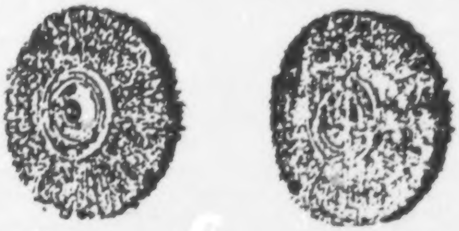

Figure 1. Wire Wheels

Figure 1: Wire wheels come in various diameters and widths. There are three basic grades of wire brushes.

a. Single strand crimped music wire
b. Single strand high quality steel wire
c. Twisted spirals of steel wire

Wire wheels are just like any other tool, designed for a specific job. The wire wheel most commonly used on a bench grinding motor which is general shop wheel made of a single crimped (wavey) wire of high tensil strength. This type is used primarily for cleaning or brushing of small parts, especially on cylindrical objects.

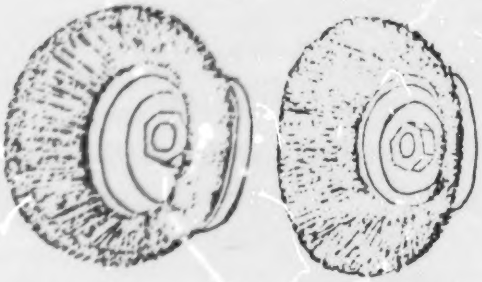

Figure 2: Cupped Wire Wheel

Figure 2: Cupped type wire wheel is generally used by the metal trades. This type of wheel is used most commonly on portable grinding motors.

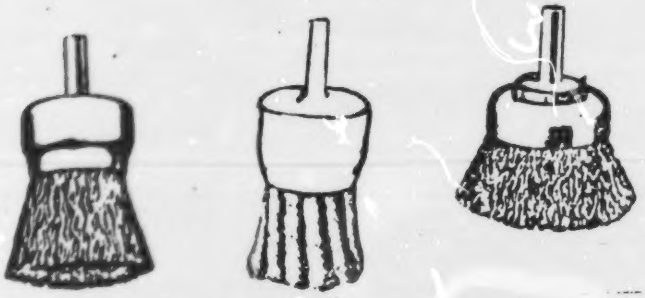

Figure 3: Rotary Wire Brush

Figure 3: A rotary wire brush is attached to a power tool. It is one of the most versatile brushes used by mechanics. This type of brush is generally used for cleaning engine cylinder heads because of its smaller size. This brush ranges in size from 1/2" to 2".

Figure 4: Hand Scratch Wire Brush

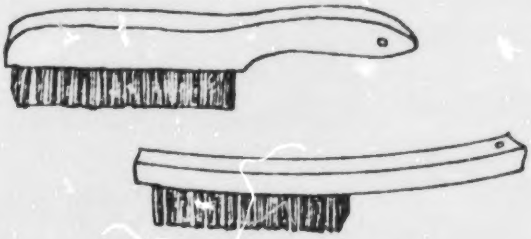

Figure 4: A hand scratch brush is used for many purposes. It is primarily used to remove loose rust particles, loose paint, and caked on dirt from metal parts.

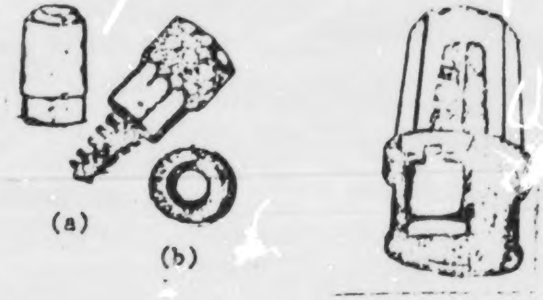

Figure 5: Battery Terminal Wire Brush

Figure 5: A battery terminal wire brush is a wire brush that is put into a special holder. It is designed to do a specific job. The (a) part is to clean the battery cable terminal and (b) part is to clean the battery terminal post.

DUTY
TASK
EN. OBJ.
DEPT.
PROG.

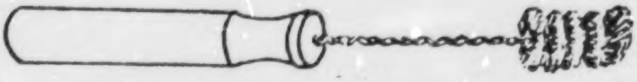

Figure 6: Lamp Socket Wire Brush

Figure 6: The lamp socket brush is an example of a specific hand wire brush. This type of brush is made specifically to clean the inside of lamp sockets to make good electrical connections.

CAUTION TO BE OBSERVED! Always wear protective clothing at all times when using wire wheels or brushes. The wires can loosen from their hub or brush and easily cause injuries.

Instruction Sheet prepared by Joe Harrison, Roy Poling, Glenn Rosenberger

SELF-CHECK FOR ENABLING OBJECTIVE 1 number PAGE 9 OF 13

DUTY

TASK

EN. OBJ.

DEPT.

PROG.

DIRECTIONS:

Evalaute your knowledge by answering True or False to the items below on a separate sheet of paper.

1. Wire burshes are primarily used for cleaning or removing carbon, paint, rust hardened deposits, or metal polishing.
2. The wire wheel most commonly used on a bench grinding motor which is a general shop wheel made of a single crimped (wavey) wire of high tensil strength.
3. Hnas scratch wire brushes are used primarily for cleaning engine cylinder heads because of
4. A battery terminal wire brush is designed to clean the battery cable terminal and the battery terminal post.
5. It is not neccessary to wear protective clothing at all times when using wire wheels and brushes

Now check your answers with the Answer Key.

SELF-CHECK FOR ENABLING OBJECTIVE 1 number
ANSWER KEY

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DUTY
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PROG.

1. True
2. True
3. False
4. True
5. False

All of your answers should agree with the answers on the Answer Key. If you missed any, go back and repeat one or more of the Learning Activities for this Enabling Objective.

LEARNING ACTIVITIES FOR ENABLING OBJECTIVE 2

number

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DUTY

TASK

EN. OBJ.

DEPT.

PROG.

Enabling objective:

Practice selecting wire wheels and brushes.

PROCEDURE

LEARNING ACTIVITIES	RESOURCES
1. Using Resource No. 1 practice selecting wire wheels and brushes.	1. a. Identification Kit: Wire Wheels and Brushes b. Self-Check enclosed.
2. When you think you can attain this task, take the Knowledge Test.	2. Knowledge Test for task
3. When you successfully complete the Knowledge Test, take the Performance Test.	3. Performance Test for task

PERFORMANCE TEST FOR ☐ ☐☐

duty task number

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DIRECTIONS:

Given access to tools you will identify wire wheels and brushes. You will be evaluated for attainment of this task based upon the items listed below.

PERFORMANCE STANDARDS ALL ITEMS MUST BE MARKED YES FOR ATTAINMENT	YES	NO
1. Was wire wheel identified?.........		
2. Was wire rotary brush identified?.........		
3. Was wire hand brush identified?.........		
4. Was cupped wire wheel identified?.........		
5. Was hand scratch wire brush identified?.........		
6. Was battery terminal wire brush identified?.........		
7. Was lamp socket wire brush identified?.........		
8. Was appropriate safety clothing worn?.........		

DUTY

TASK

ATTEMPT

STUDENT

DATE

☐ Attained

☐ Not attained

EVALUATOR

DEPT.

PROG.

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LIST OF RESOURCES, MATERIALS, AND EQUIPMENT

PAGE 13 OF 13

DUTY

TASK

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PROG.

Instructional Resources

Schulz, Erich. Diesel Mechanics, McGraw - Hill Inc, New York, 1977

KNOWLEDGE TEST FOR ☐ ☐☐ PAGE 1 OF 2

duty task number

TASK:

DUTY

TASK

DEPT.

PROG.

DIRECTIONS:

Evaluate your knowledge by answering the items below on a separate Answer Sheet.

DO NOT MARK ON THIS TEST!

The items below are Multiple Choice. Use a No. 2 pencil to fill in completely the lettered box corresponding to your answer. For example, if you believe the correct answer relates to box c, fill in box c as follows:

Example: ☐ ☐ ■ ☐

To change your answer, erase completely and re-mark.

1. Wire wheels are primarily used to:

   a. cut metal.
   b. bend metal.
   c. clean metal.
   d. drill metal.

2. Wire wheels come in various:

   a. diameters and widths.
   b. lengths.
   c. speeds.
   d. colors.

3. The general shop wire wheel is attached to:

   a. wood handle.
   b. vise.
   c. bench grinder.
   d. hand tap.

4. The cupped wire shell is primarily used in the

   a. carpentry trade.
   b. metal trade.
   c. drafting trade.
   d. cosmetology trade.

KNOWLEDGE TEST FOR ☐ duty ☐☐ task number

CONTINUED

PAGE 2 OF 2

DUTY
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5. The cupped wire wheel is attached to a:

   a. wood handle.
   b. vise.
   c. work bench.
   d. portable grinding motor.

6. The rotary wire brush is generally used to:

   a. cut metal.
   b. bend metal.
   c. clean engine cylinder heads.
   d. grind metal.

7. The rotary wire brush is attached to a:

   a. wood handle.
   b. vise.
   c. power tool.
   d. work bench.

8. The hand scratch wire brush is primarily used to:

   a. cut metal.
   b. bend metal.
   c. grind metal.
   d. clean metal.

9. The battery terminal wire brush is primarily used to:

   a. paint the battery terminals.
   b. clean the battery terminals.
   c. bend the battery terminals.
   d. drill the battery terminals.

0. When using a wire wheel or wire brush, always wear the proper safety:

   a. clothing.
   b. shoes.
   c. helment.
   d. gloves.